

A Design For The Layout
OF
Indian Transport & Communication System

BY

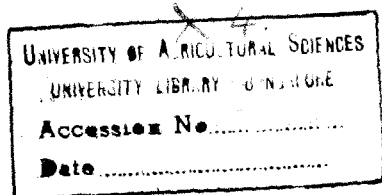
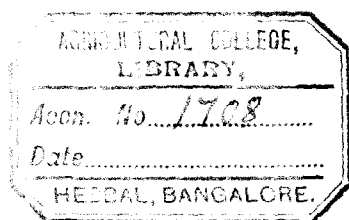
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TO
The Sacred Memory
OF
My Father and My Mother

FOREWORD

Primary needs of mankind are food, shelter, clothing and transport. Amongst these, Transport is very important because it directly or indirectly contributes to the development of the remaining necessities of life. Under Transport, I envisage a great necessity of fourfold development viz. (i) Roads (ii) Railways (iii) Waterways and (iv) Airways. All of them are important in their own way but roads require special attention of the country.

On India's national emblem there is a wheel (ASHOKA CHAKRA), which is inseparable from the ideals of speed and facilities of movement. Both these demand good roads. More than eighty percent of our population live in villages. These villages, in most cases have no access to towns and cities where they can sell their produce and buy their daily needs. During monsoon, many of them get entirely cut off and it becomes next to impossible to provide them with medical relief in case of epidemics and other essential necessities of life. They become islands of isolation where good things of the world cannot be conveyed. Macaulay has rightly said, "Those inventions which bridge distances have done most for civilization." In the chain of civilization, distribution and exchange, communications provide the first essential link. Roads are the channels along which the fertilising commerce of the country flows. They fulfil in the economy of the nation the same function as arteries and veins do in a human body. If the resources of the country are unknown and undeveloped, if the abundance of nature in one area is often accompanied by the visitation of famine in another, if societies are isolated, educational facilities limited, health services non-existent or elementary, trade and commerce smothered or restricted, it is because the channels along which the life blood of the nation flows are choked up, neglected and undeveloped. Progress has no meaning if the values of life are denied to the poorest villager. Easy and speedy travel is the freedom, which the Country should win for all, because it ensures freedom of association, freedom from restraint, freedom of trade and commerce, freedom from the shackles of time and space. In comparison with other leading countries of the world, as pointed out by Dr. Deodikar this vast and thickly populated subcontinent is very poor in communications. I fully agree with the author that this disability is a great retardation to Country's progress.

Apart from necessity, a good system of roads is justified on grounds of economy. A Country pays for its roads whether it has them or not and it pays more when it does not have them. This statement is nothing short of truth. If we evaluate in terms of money, the time and labour wasted, wear on our animals and vehicles, slackness in trade etc., we shall be convinced that it would be more economical to spend for the construction of roads. The cost of transport without an efficient road system is enormous and it substantially adds to the prices which consumers have ultimately to pay.

Without Railways, transport in big bulk and over long distance is impossible. For a vast country like ours, much higher mileage of Railways is necessary. The present system is unable to bear the continuous heavy strain and cope with the requirements of the Country, with the result that our industries are not able to get their fuel and raw material requirements and production is going down. Expansion of the Railway system is therefore highly essential.

It is also necessary to develop our water transport. The country has a long ocean frontage with inland creeks and a number of large perennial rivers. These require to be developed as marine bases and for inland water transport.

In these circumstances the Author has rightly stressed the vital necessity of good transport and communications in this Country if healthy growth of nation and prosperity of the Country are to be achieved in the minimum time possible.

Lack of system and haphazard development in any scheme of national reconstruction ultimately smother the future growth of the nation and posterity would blame the present generation for not having applied proper thought to the methodical development of a particular scheme. Dr. Deodikar's book on "the Design for the layout of the Indian Transport and Communication System" puts before the Indian public how Country's system of transport and communications should be planned and developed so that the Country may have a systematic network of main and feeder roads. Instead of having various zigzag and serpentine alignments, it is certainly desirable to have rectangles formed by a network of roads running along the degree and the minute lines of longitudes and latitudes. These rectangles may be a degree, a minute or half a minute apart depending upon population intensity of agriculture and industry and future scope of their expansion of any particular

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locality. The existing idea of providing roads merely to connect and serve cities and towns by any zigzag or oblique lines is in my opinion not sound. India is primarily an agricultural Country and any roads passing through open country along squares as suggested above is sure to help the development of agriculture by providing suitable facilities of transport. India has at present only a meagre mileage of roads and railways and many more miles of both have to be constructed to bring the Country's system to even the minimum reasonable standard. Due to chequered finances of the Country, this development is likely to take a number of years before anything worth the name is actually constructed. In the meanwhile a number of buildings are being erected, a number of factories springing up and a number of farms and fruit and vegetable gardens being put up all over the Country. After several years, it would be difficult to align new systems of transport because of these man made obstructions dotted all over the place. It is therefore highly essential to prepare a master plan showing the north-south and east-west alignments of roads and railways for the whole country along lines of latitudes and longitudes. Government should prepare such a plan with the least possible delay and make it available to the public so that nobody may erect any constructions along these lines. This is the minimum need of the hour, if future alignments are to be straight, ribbon developments are to be avoided, and the valuable investments of the people are to be saved. To illustrate this point, I would like to quote the example of Bombay, the Premier City of India, whose main roads like Girgaum, Kalbadevi and Mohmedally Roads could have been quite straight if some one had devoted proper thought 100 years ago. On the other hand, two main lines of Railways viz. the B. B. & C. I. and the G. I. P. are running fairly straight even within the city areas only because they were properly demarcated before the actual development of the City took place. This is what is required to be done for the whole country far in advance. Our development is in its infancy and what pitfalls are to be avoided by foresight require to be thought of without delay. I would therefore again stress the urgency of a country-wide Master Plan for a net-work of transport as suggested above and that too before mistakes are multiplied. Wherever formidable obstructions like hills or existing grown up cities come on the alignments, suitable short detours may be made connecting the north-south or the east-west alignments.

The Author has given in his book very interesting statistical information and his analysis of the problem is exhaustive. The

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economic plan suggested by him for (i) Roads (ii) Railways (iii) Tele Communications (iv) Power Lines (v) Air Bases and Inland Airways (vi) Marine bases and inland Water transport is well-conceived and thought-provoking and deserves encomiums and encouragement. I congratulate the author for his masterly presentation of the problem and I have no doubt that it would soon enlist the support of the Central and all Provincial Governments and every right-thinking person in this Country.

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PREFACE

With the achievement of political independence, our next objective is the social and economic regeneration. We have achieved a considerable measure of success in overcoming problems that challenged our freedom at its very inception and the manner in which we have faced the whole situation has enhanced our confidence. Especially after the merger of states, we are in a better position to divert our thoughts to socio-economic problems that demand immediate and pointed attention. In fact, many of the new difficulties that now appear to threaten us are all due to want of a definite socio-economic programme which alone can engage the upsurge of mass energies and channelise them along constructive lines. In the context of international trends, we can ill afford to ignore the new clouds that have been advancing around our horizon.

There is an intense popular urge for the alround betterment of our conditions and the nation is on the verge of a new regeneration. There have been some attempts to express our aspirations in vague hazy outlines. The time is now mature when we must fill in the details and draw a more definite and precise picture of what exactly we wish to have. A thing exists in mind before it exists in fact and the more we make our minds clearer about what we aspire for, the more orderly will be the material creation that we want to shape. The present contribution is just an attempt to stimulate objective thinking and discussion so as to make our minds clearer before we decide upon a plan for the social and economic betterment.

The problem of reorganising our national transport has been considered on an altogether unconventional premises. The transport and communication lines have been treated as mere means for achieving certain social and economic ends. In fact what has been proposed is a system of reorientation in the pattern of human settlement—a rearrangement of our affairs after centuries of inaction, inertia and slumber. Such a process may considerably help us to get out of the old rut accumulated so far, inspire us with a fresh zeal to do something in keeping with the glorious traditions inherited from the past and reawaken us to those values and ideals that have given us a national individuality which can endure inspite of all that has happened.

What has been proposed in the following pages is anything but a "Plan." It is only a tentative outline drawn with the view of providing some concrete objective basis for further discussion and elucidation of the whole problem. No plan formulated by an individual can or should be accepted in its totality. Any plan which we finally decide upon for putting into actual operation must be a product of collective intelligence to which as many as possible should contribute.

The author is just a student of Biology and can claim to have only a laymans information regarding engineering, architecture, economics and allied subjects. During 1942 to 1945 he had to work at a place where he could not continue his regular studies for want of laboratory facilities so that he had to look for some other pursuit to keep his mind occupied during the spare time. The choice of the present subject was purely a matter of chance. The author is quite aware that in writing on the present subject he has trespassed into spheres not his own. He therefore expects and deserves to be criticised and very severely too. If during the course of such criticism, better suggestions and ideas would be forthcoming, the present contribution shall have served its purpose.

A space may be super-saturated with humidity and yet it may not rain unless there are a few dust particles around which the moisture can condense into raindrops. Such phenomena in the physical world find their analogy in the social processes in human affairs also. The popular consciousness in our country is super-saturated with an intense desire to have a plan for socio-economic betterment. The present contribution can have no better function than the one of an inconspicuous dust particle in the above analogy. If it can be least little instrumental in precipitating our intense but vague ideas and aspirations into a concrete blue print of a final plan, the present contribution will have covered its scope in ample measures.

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15 Aug.-1949.

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I

The National Planning Committee inaugurated in 1939 constitutes the first concrete, well organised and collective effort for economic reconstruction. Previous to this, some notable efforts were made in that direction in individual capacities. Recently, different schools of thought have contributed their own schemes for the reconstruction programme. Those that have received considerable public attention are the "Bombay Plan" put forth by some eminent industrialists of our country, the "People's Plan" released by the Radical Democratic Party, and the "Gandhian Plan" based on the ideals of Gandhiji as regards social organisation. The All-India Congress Committee had appointed an Economic Programme Committee in order to implement the terms of its Election Manifesto of 1945-46 and to give a concrete shape to the ideals formulated in the "Objective Resolution" passed in the course of the A. I. C. C. session held in November 1947. This Economic Programme Committee has recently published its preliminary report which gives a broad outline of the future plan. All these plans, however, are in the nature of preambles and not "blue prints." They only indicate in a broad and general manner, the objectives aimed at without going into details as regards the means, methods and organisation necessary to achieve them. The present situation demands that we must give as much attention to the means as to the aims in view. It appears we have already given sufficient deliberation to the problem as to *what* should be done and now it is high time to think, *how* to do it in the best possible manner. The more we think and express on this aspect of the question as to *how* to do it, the sooner shall we see the blue print stage of our national planning. The term blue print implies considerable amount of definiteness and finality even as regards minute details of procedure. In order to have this requisite degree of definiteness, various ideas coming from whatever source must be carefully weighed and judged on their own merits irrespective of political prejudices or any other extraneous considerations. Planning, if it should be least susceptible to some of its inherent limitations, must always be preceded by a dialectic process of free exchange of thoughts and mutual corrections through constructive suggestions until we arrive at the final synthetic stage. Such procedure may help us to precipitate our vague ideas about planning into something concrete and definite in the form of a final blue print

and give us a clear notion about the shape of things to come. The present contribution of some thoughts on a design for the lay-out of an all-India system of transport and communication has been made with this object in view. Its essential purpose is to provide a basis for a more comprehensive discussion on the problem of reorganising our national transport and communication system, in its manifold aspects and implications.

TRANSPORT : THE PRIORITY ITEM IN NATIONAL PLANNING

In any comprehensive plan for national reconstruction, the problem of transport and communication logically deserves priority. This obvious fact would not have required any specific emphasis if it were not for the fact that conflicting views prevail in our country on this point. There are some who maintain that for the purpose of village uplift, it is quite unnecessary to undertake any construction of new roads or railways. Others think that industrialisation should precede road development. In holding such views we ignore the fact that village uplift, industrial growth and road development are all interdependent. Healthy economic growth requires simultaneous and coordinated activities on all these fronts. Excessive concentration on one at the cost of another would naturally result in uncoordinated and ill-balanced development. This is particularly so in the case of India with its transport system still in a primitive state. It is, therefore, difficult to understand how we can think of a programme for industrialisation or rural uplift, which does not include the construction of good servicable roads as one of the important items. Also, if industrialisation is undertaken without concurrent reorganisation of transport, we would naturally locate our new industries along the old roads and railways or concentrate them at the existing industrial centres. This would intensify the present regional disparity as regards the industrial developments and lead to unbalanced rural-urban relations, which can be avoided if extensions both in roads and industries are undertaken simultaneously in a well coordinated manner according to a preconceived systematic plan.

It is possible that these contrary views were expressed by way of reaction to the official "Nagpur Road Plan" sponsored by the foreign regime. The main concern of this road plan seems to be to provide some form of employment to the demobilised persons returning from war and not the genuine economic progress of the

country as such. But irrespective of any such plans and the motives behind them, if we are to form our own unbiased opinion, the fact remains that reorganisation of national transport and communication is an essential prerequisite which must be undertaken simultaneously and in coordination with other urgent problems like rural uplift or industrial growth. Agrarian economy is the basic foundation of our national structure and we cannot effectively deal with the problem of reconstruction without an efficient system of transport and communication that can assure free circulation of necessary commodities and link each one of the seven lacs of villages in a common coordinated effort. The National Planning Committee has emphatically pointed out in its preliminary report that "lack of adequate and cheap transport facilities in rural areas is the greatest handicap in the economy of India". In this respect our condition is very much similar to that of China and it would, therefore, be relevant here to indicate the way in which the Chinese Republic wants to deal with the problem. The plan¹ for economic reconstruction of China has been drafted as early as 1922 by Dr. Sun Yat-Sen, the father of modern China. This plan is still considered to be "The last official word" or a "blue print" for the reconstruction of China with necessary revision to meet the new altered situation. Dr. Sun's plan has been presented in six parts out of which the first four parts have been exclusively devoted to reorganisation of transport and communication system of the entire country. He has proposed to open about 16 natural harbours of major and minor importance evenly distributed all along the enormous ocean frontage of the Pacific coast and to connect these new ports with the hinterland by constructing three well coordinated railway systems for northern, central and southern China extending upto the borders of Siberia, outer Mongolia and Russian Turkistan. For central China he has proposed to canalise the river streams and reorganise all the inland water transport with navigable Yangtze river as the trunk line. It is a comprehensive plan providing for 1,00,000 miles of railways, 25,000 locomotives, 30,000 freight cars, 30,000 passenger cars, 3,000,000 automobiles, 10,000,000 tons of shipping, 80,000,000 miles of tele-communication wires, 20,000,000 kw. of electric power, 1,000,000 miles of roads and construction of new modern cities at all transportation centres. Dr. Sun has shown how this would help to develop the untapped mineral and other resources, stimulate both agriculture and industry

1 Sun Yat-Sen : The International Development of China, 1922

and make room for congested coastal population towards the land interior. More than 75% of Chinese industry was subjected to pathological concentration in coastal regions round about Shanghai and due to complete lack of transport facilities, an immense territorial expanse of Chinese interior was almost an industrial vacuum. Products of coastal industries could be exported and sold much cheaper in other countries than in Chinese interior itself.¹ Therefore, one of the basic principles governing Dr. Sun's plan is that *arrangement must first be made to secure free and unimpeded circulation of commodities.*

In the case of Russia, during the execution of the first five year plan, one of the main priority item was "The war with the miles" which consisted in establishment of an efficient system of transport in order to mobilise "The flood of freight" throughout the tremendous territorial expanse of the Soviet Republics. The chief slogan of the time was "Fight for transport, for bread and coal." In spite of her great agricultural and other resources, poor communications had blighting effect and "it was scarcely able to feed the urban population while wheat was rotting in her southern fields."² In 1928, U. S. S. R. had 24,300 km of high ways of which only 4,800 km were paved. Under the first five year plan of 1928-33 a total of 93,000 km of new roads were constructed.³ Even the latest Soviet five year plan for 1946-50 gives primary emphasis on transport and provides for 50,000 km of new rails in addition to repairs of war affected lines; electrification of railways running to Urals and Siberia, construction of economic types of diesel locomotives for Caspian low lands, central Asia and Caucasus; design of freight parks, wagons, loading and unloading devices and such other problems.

It is therefore evident that in any comprehensive plan of national regeneration, if we want to arrange our programme in a proper sequence according to order of priorities, the transport and communications is one of the problems that deserve our first attention.

1 Ho Kwan-Heng: China's post-war economic plans. Modern Review-1944.

2 Ilin M.: Moscow Has A Plan, (English translation, Jonathan Cape Ltd, London, 1932.

3 Tverskoi K. N.: The Unified Transport System of the U. S. S. R. 1935.

II

REVIEW OF EXISTING POSITION

Our existing situation regarding transport and communication services may be briefly summarised.* We have about 43,000 miles of railways running on four different gauges. There are about 350,000 miles of roads out of which only about 3% are well surfaced with hard crust according to modern standards, 24% are simple water bound macadam and the remaining 73% are low type gravel, murum or natural soil fairweather roads, cart tracks, bridle paths etc. Financial interest of the alien Government in profitable working of railways has led to considerable neglect of roads. The Agricultural Commission has emphasised the blighting influence of this situation on the rural economy. The Jayakar Committee of 1927 for road development has pointed out that construction of new roads in India is passing beyond the financial capacities of the local Government and is becoming a national interest which should be a proper charge on the central revenues. The Jayakar committee also recommended coordination in road development and research in road construction by the formation of a Central Road Board with due regard to distribution of central and provincial functions. Construction of Indian railways started since 1844 proved to be a great drain on national resources due to the payment of fixed dividends on the foreign capital invested in it under the old and new guarantee systems. Since the commencement of railway profits in 1900, a period of rapid extension followed upto the beginning of the first great war. But, after that the extension of railways in India has been very slow or almost negligible.

The number of suitable ports which are well developed is exceedingly small as compared to the extensive ocean frontage. The seven major Indian ports have a total capacity of 20 to 25 million tons per year. The total tonnage of Indian shipping is insignificant as compared to that of other countries. The Mercantile Marine Committee of 1923 recommended Calcutta as a suitable centre for a self-

* (1) Visvesvaraya, M. *Planned Economy for India*, 1936.

(2) Jathar, G. B. & Beri, S. G., *Indian Economics*, 1936.

(3) Antia, F. P. *Transport*, 1936.

(4) Kynnerseley, T. R. S. *Roads for India*, 1936.

propelled-ship-building industry due to the vicinity of coal and steel centres. But no progress in this direction was made. Since the termination of the recent war, a small ship-building yard is operating at Vizagapatam harbour. Before war, Indian maritime trade annually carried nearly 30 million tons of cargo and half a million passengers. Largest inland traffic is handled by railways which annually carry about 500 million passengers and 100 million tons of goods. Bullock carts, country crafts and small river boats carry less than 10% of the inland traffic. The civil aviation department of the Government of India was established in 1927, but apart from some stimulus received during the war little progress has been so far made in comparison with other countries. There is about one Post Office for every 10,000 of the population, and the *Per capita* distribution of postal articles used to be about 4 during prewar years. During the same period, there used to be about 5 telephones and 1 Telegraphic office for every 30,000 of the population. The Government of India under the stress of war conditions, had undertaken extensions of telegraphic and telephonic services which were to raise our total length of tele-communication wires to 9 million miles. Under the recommendations of the official Chief Engineers Conference held at Nagpur (1943) Government of India had prepared a plan to build 400,000 miles of new roads within 20 post-war years at an estimated cost of 450 crores. The basic idea underlying this plan has been summarised in the presidential address before the eighth session of the Indian Road Congress, 1943, where it has been indicated that no village with a population of one thousand and over should be more than a mile or two from the public highway. The Bombay plan proposes an increase of 50% in the existing railways and 100% in road mileage, within a period of 15 years at an estimated cost of 9,000 crores which also includes improvements on ports and shipping. The "Peoples Plan" suggests construction of 670,000 miles of either new or reconstructed roads. The National Planning Committee in its preliminary report, has made several concrete suggestions as regards the general lines along which improvements in transport and communication should proceed. It has stressed the need for a central authority for coordination and has suggested that programme for road development should be looked upon as a means of national progress and not as a mere source of revenue.

NATURE OF THE PROBLEM

It has been stated earlier that only about 3% of our total existing roads can conform to modern standards of construction and

maintenance. If we add to this about 24% which are simple waterbound macadam, it will be seen that only 27% of our present roads are actually serviceable all the year round. The remaining 73% are "good for nothing—ruts, holes, pits, dust, mud and crazy bridges or none at all." In fact, these can hardly be called roads since they are simple tracks marked by the wheels of the bullock cart and ramifying at random in a serpentine manner through cultivated fields. They are low water channels during monsoon and dust bowls during the rest of the year. Surely, it should be much cheaper, easier and faster to construct new village roads on some hard and raised *fresh* substrata than to reconstruct or convert these low lying water-channels and dust-bowls into roads.

Even if we take into account these so called roads their total mileage in proportion to area and population is far too short as compared to that in some other countries as given below in table I.

Table I

Roads in India and other countries.

Country	Road mileage	
	Per sq. mile	Per 100,000 population
England	2.02	392
France	1.84	934
U. S. A.	1.03	2,500
Germany	0.95	260
India	0.22	89

The standard of road services in England and France is, therefore, nearly ten times better and that in U. S. A. and Germany 5 times better than that in India. There is another important difference between India and other countries. In India only about 30% of the total roads are actually serviceable whereas in the case of the above countries all their roads specified in Table I are serviceable for any vehicle all the year round. Judged on the basis of this criterion, countries like England and France have almost 25 to 30 times more roads per square mile of area as compared to what we have in India.

As regards railways, India has 2.2 miles per 100 sq. miles of area or 7,900 persons per mile of railway. Corresponding figures for U. S. A. are 8.5 miles per 100 sq. miles of area and 469 persons per mile of railway. Europe, excluding Russia, has almost the same area as that

of India but its total railway mileage is more than 5 times that of the latter. As early as in 1898 Mackay Committee has expressed that even an estimate of 100,000 miles of railways was short of what may ultimately be found necessary in the case of India. But we have not yet fulfilled even half of this requirement which was thought necessary about half a century ago.

These considerations would make it clear that the total mileage of existing roads and railways in India is extremely unsatisfactory as compared to other countries and of whatever roads we have, only a very small fraction is actually serviceable. Especially our roads and railways do not adequately serve the vast rural areas which form the basic foundation of our national economy. The Need for construction of both roads and railways many more times their present mileage is therefore obvious. At this stage, a question naturally arises in what manner these new constructions of roads should be undertaken. There would be two alternatives:—

- (1) A New all-India transport system to be devised with primary reference to our existing roads or railways so that the new roads or railways would be simple extensions of the present old ones.
- (2) The development of a new all-India transport system to be undertaken according to a systematic and well thought out one general plan for the country as a whole, irrespective of the old roads and railways. In devising such an integrated general plan, the insignificant proportion of our existing transport lines need not be taken into account, if their consideration as primary reference lines to start with, would make it impossible to give effect to certain ideals in view. The new transport system can be designed independently and afterwards some of the old roads and railways can be incorporated or accommodated in it with certain changes by way of secondary adjustments. Some of the old roads or railways which cannot be so incorporated or adjusted, can be retained as alternative traffic lanes which are always necessary and are invariably provided in other countries for emergency and strategic reasons.

The design for all India transport system suggested here is based on the second alternative course. In the case of first alternative, the new transport system would simply be an extension of

the present haphazard growth of roads and railways which were never constructed according to one general plan. There are certain chronic evils associated with the *manner* of development of the existing roads and railways. These evils include unbalanced urbanisation, concentration of industries, lack of any coordination between agriculture and industry, or rural and urban economy. In following the first alternative, there is greater chance of intensifying these evils instead of arriving at any solution. In the case of the second alternative, we can rationalise the rural-urban relations by a systematic location of new industries at suitable points along carefully preplanned lines of future transport. Through the medium of properly designed transport system, it will also be possible to co-ordinate the various facets of our national economy in any manner in which we want to shape it. For reasons explained later the second alternative would require much less linear mileage of roads as compared to the first one, even after excluding the old roads from consideration. This procedure would, therefore, be more economical. Various other advantages associated with the second alternative have been specified at relevant places in the pages that follow.

It would appear from the above that we must build new roads, at least ten times the total mileage of our existing roads, in order to come up to the standard of some other countries. The existing insignificant roads need not therefore be given undue importance while designing our future all India transport in an ideal manner. Every one mile of road which we now have, need not be a limiting factor while determining the ideal way in which we may have yet to build 10 miles of our new roads. The absence or shortage of roads in India, which was a disadvantage so far, can actually be turned to advantage for the purpose of our new planning. In fact, in a way we are fortunate because we can begin as if on a clean slate. It would be strange to consider an ancient country such as ours as a clean slate. But somehow, in so far as it concerns the relative development of roads in comparison with that in certain other countries, the situation is really like that. Many of us who are accustomed to staying in cities and towns and who had no occasion to come across the realities of rural life in India, are apt to consider this as an exaggeration because they actually see around them every day a profuse network of roads, railways and tramways. However, according to the reports of the Bombay Economic and Industrial Survey Committee 1940, in some of the districts of the Bombay Province as much as 75% of the areas

are not served by any roads at all and "by no other form of transport either." If this is so in an industrially most advanced province like Bombay, in all probability, the situation must be far worse in other parts of India. Therefore, even if we cannot call India a clean slate in respect of roads, the lines described are so very few that there are still many clean inter-spaces profusely scattered all over. We can at least make the maximum use of the clean parts of the slate for the purpose of new planning.

For reasons specified above, the design for Indian transport system proposed in the following pages does not take into account our old roads and railways. Such of our existing lines of transport as can be incorporated in the new design either as such or with minor adaptive changes, have been specified at relevant places later. Old roads and railways which cannot be so incorporated or adapted can continue to remain as alternative traffic lanes, which are invariably provided in other countries as an emergency measure and for relieving the pressure of excessive traffic congestion as stated above. Thus our existing old roads and railway lines running between major cities like Bombay, Madras, Calcutta, Delhi, Lahore or Peshawar do not exhaust the need for more alternative lanes to be suggested under the new design described in the following pages. Due to ribbon development along all our roads, there are serious limitations as regards the possibilities of their improvement so as to conform to new standards and requirements. Also, the major parts of our existing railway system would require some rearrangement since they run on four different gauges. In view of all these considerations the most practical way of approach to the whole problem would be to design the new transport system *irrespective* of our existing roads and railways which should be looked upon in future simply as alternative traffic lanes. This may be appreciated particularly in view of the fact that (1) even after excluding the old roads and railways from consideration in this manner the total estimated linear mileage of all India transport system to be proposed here would be less than the provisions already made by any of the plans so far proposed; and that (2) all old and new lines of transport will mutually coordinate themselves at all the points wherever they will meet. Thus the *exclusion of old roads and railways from the present design does not amount to suggesting something which has no relation to existing order of things*. Such exclusion should, therefore, be understood against the background of all the considerations explained above. Otherwise in view of the absence

of any reference to our existing roads in the following pages, one would naturally like to criticise and wonder whether the new design proposed here is meant for some newly discovered country about to be colonised by the immigrants. Obviously this would be strange presumption in case of an old established country like ours. It is evident that India is already inhabited by crores of people who have, since long, spread over its surface and determined its character. Therefore, any scheme for reorganisation of our transport cannot afford to ignore this simple basic fact. In fact one of the main purpose in suggesting this particular design for our national transport system is that it should suit itself with some of the characteristic features about India which distinguish India from the rest of the advanced countries. If we examine the manner in which the crores of people have spread themselves over the surface of this country, it will be seen that India is predominantly rural in its character and not urban. In the case of England, Germany and other countries it can be said that London or Berlin represents the national pattern of the country. But we cannot, likewise, say that Bombay, Madras or Calcutta represents India. It is represented through innumerable little villages which harbour 90% of its population. So far as this real India is concerned utility of our existing roads and railways is conspicuous by its absence. Since the design for all India transport system proposed here is primarily concerned with the problems connected with these vast rural areas in India the exclusion of our old existing roads or railways from consideration, for various reasons explained above, need not be taken too seriously.

(C) GENERAL ORGANISATION AND CONTROL

Transport and communication lines in a country serve the same essential purpose as do the circulatory and nervous systems of the living organisms and the former may, therefore, be planned on the basic principles analogous to those which operate in the latter case. In spite of the recent political partition, India must be treated as an organic unit in laying down its vital lines of transport and communication which must be planned on the basis of the fundamental realities as regards the organic unity and territorial integrity of the whole of India within its natural frontiers.

Since the political constitution of India must assume the shape of a federation of several partially autonomous regional units,

the all India system of transport and communication may be conveniently separated into two broad divisions as (a) *the Federal system* and (b) *the Regional systems*. The former should deal with inter-provincial and the latter with intra-provincial services and the two systems should be well co-ordinated under the central control of an *All India Federal Board of Transport and Communication*.

Each of the Federal and Regional transport systems should be further classified into three categories as the (1) *Primary*, (2) *Secondary* and (3) *Tertiary* lines, depending on the relative importance of the purpose which they are intended to serve.

The Federal System of Transport and Communication should incorporate in itself the following items: (1) Federal roads, (2) Railways, (3) Inland waterways running through more than one regional units, (4) Federal ports, marine bases and navigation (coastal and trans-oceanic), (5) Federal air-bases and air-ways (inland and international routes), (6) Postal services, trunk lines of telegraphs and telephones, (7) Federal grid lines for inter-regional transmission of electric power, (8) Federal stations for wireless transmission and radio broadcastings and (9) Federal News Service.

Regional System of Transport and Communication should incorporate in itself the following items: (1) Regional roads, (2) Tramways, guideways, goods trucks, passenger cars and other means for intra-regional transport of men and material so as to feed the Federal lines, (3) Inland waterways confined within the regional limits, (4) Coastal shipping so as to operate feeder services between the federal ports and marine bases, (5) Regional aerodromes and landing grounds, (6) Regional telegraph and telephone services, (7) Regional grid lines for intra-regional transmission of electric power, (8) Regional short range wireless transmission and radio broadcasts in regional languages and dialects and (9) Regional News Service.

Regional Boards of Transport and Communication should consist of members who are technically qualified to plan, execute and administer the functions of the Boards under various regional items listed above. In addition to collective responsibility of all the members, each member should be assigned the charge of one or more of the regional items in respect of which he may be having special knowledge and qualifications. The Cabinet Minister of the

Regional Government holding the portfolio of transport and Communications should be the President of the respective Regional Board of transport and communications.

Federal Board of transport and Communications should consist of members who are (1) delegates from various Regional Boards of transport and communications functioning in each of the regional units of the Federation, (2) Technical experts and departmental heads of the Federal Government in charge of the various Federal items of transport and communications as listed above, and (3) Co-opted representatives for Agriculture, Industry, Commerce and other relevant interests. In addition to collective responsibility of all the members of the Federal Board, each member should be assigned the charge of one or more of the subjects in respect of which he may be having special knowledge and qualifications. The Cabinet Minister of the Federal Government holding the portfolio of transport and communications should be the President of the Federal Board of Transport and Communications.

All the Federal items of transport and communication should be financed, owned and maintained by the Central Government and the income arising out of these should form a part of the Federal revenue. So also the regional items of transport, should be financed and owned by the respective regional units and managed through their own Regional Boards of Transport and Communication.

In the case of lines of major importance subjected to heavy pressure of traffic the alternative modes of transport such as roads and railways may run parallel or closely side by side. In such cases mutual relations of the alternative modes can be so adjusted that they should operate as complementary or supplementary lines to one another and not as competitive. This may be done either by adequate method of taxation or by nationalisation of transport services both along roads and railways. The regional lines of transport should be laid out in such a manner that they should not serve as alternative or competitive routes for the Federal lines but should simply serve as feeders for the entire Federal system.

In order to avoid multiplicity and overlapping and to give effect to the same uniform policy and co-ordination between Federal and Regional lines, both the Federal and Regional Boards of transport concerned, should jointly work out a plan for each of the

regional units. After such plans have been made in this manner, the execution may be done by the respective regional units, within their own areas.

The regional units of the federation must delegate to the Central Government all the necessary powers relating to land acquisition and other incidental matters throughout the area covered under the federal lines.

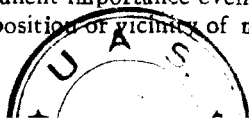
III

FEDERAL LINES OF TRANSPORT AND COMMUNICATION

In determining the orientation of the Federal lines of transport and communication, primary consideration should be given to the following points :

(1) General shape of the country and its natural geometrical co-ordinates in the direction of its land extremities, (2) topography of the land and the relative distribution of the internal geographical barriers, such as hills, valleys, rivers etc., (3) relative importance of the various parts of the country from the point of view of population, agriculture, mineral and other natural resources, industrial raw materials etc., (4) position of the important natural harbours along the coastline and their relation with the land interior, (5) nature of the land frontiers, position of the principal mountain passes and foreign roads along the land frontiers, (6) political and administrative problems, and (7) strategical and defence considerations.

Consideration of cities and towns usually assumes primary importance in the construction of new transport lines or the extension of old ones. In this respect, however, we must exercise some discretion. Unlike other industrially advanced countries, there are very few cities in India which owe their urban status to causes such as presence of ship-building yards or production centres of aeroplanes, heavy machines, tools or basic chemicals. All this is just what we have yet to do. The urban status of most of our old cities and towns can be traced back to causes such as centres for pilgrimage, places of capital of ancient kingdoms or location of some state administrative functions. Majority of them have grown to their present eminence due to the operation of some historical factors which may have no significant relation to the particular objectives of our future planning. Therefore, instead of laying undue emphasis on all the old cities, we must design the new all India transport system with main relation to some of the broader considerations as listed above. Some of the old cities which must continue to have permanent importance even in future due to their privileged geographic position or vicinity of mineral resources and



such other natural causes must of course be taken into account for the purpose of new planning. But the majority of the cities do not have any such special significance apart from their congested population and a considerable portion of this population may voluntarily like to get mobilised to some adjacent new industrial centres which we envisage under the reconstruction programme. Cities and towns of this type need not therefore be given undue importance in designing our new transport system. This idea may be understood in view of the fact that (1) all these old cities and towns are already well served with existing roads or railways and (2) old and new lines of transport will be mutually coordinated at all the points wherever they meet. *Therefore, even if we do not take into consideration some of these cities while designing the new transport system, it does not mean that they are entirely excluded from the final co-ordinated picture.* So far we are accustomed to think too much in terms of cities which represent only 10% of the population and too little about villages. This attitude must undergo a drastic change. In designing the new transport system, we must focus our main attention on the needs of the innumerable villages profusely scattered all over India.

The conventional method of reorganising the transport system would be to focus the main attention on existing trunk roads that connect the big towns like Bombay, Calcutta, Madras or Lahore. Then using these as the primary reference lines, major and minor roads are extended or added as tributaries so as to connect some other minor cities, towns and villages. The result is a profuse complicated network system of wavy undulating roads ramifying at random. Such trunk roads which were constructed with the primary object of connecting two or more principal cities, usually run in the direction of crows flight. Thus whatever areas which accidentally lie along their path alone get the major benefit leaving considerable part of the country either far too away from them so as to be practically beyond an easy reach or very remotely connected to the principal highways through a confusing network of minor roads. Such profuse network system of wavy roads or rails unnecessarily involves much more linear mileage of transport and communication lines than what is actually necessary, without any corresponding increase in their utility as regards the extent of area served. It also renders the management and operation of tele-communication wires and electric power lines extremely complicated and difficult if not altogether impossible. This

considerably reduces the operational ease and efficiency of telecommunication and electric services. Such system of roads further results in uneven facilities of transport as among different parts of the country as a whole and thereby leads to regional disparity as regards the relative speed of progress in industrial, agricultural and other spheres. Layout of future transport system on the basis of these old conventional methods would surely result in their uneven distribution from all India point of view and thus intensify the unbalanced regional development which has already occurred. In building the new transport system with an idea of bringing every village in remote corners within reasonable distance of the national highways and to serve it with electricity, telegraphs, telephones, educational medical, cultural and other facilities or all that modern science can possibly give, we must follow an altogether different procedure in planning the layout than what we are accustomed to do so far. Our basic idea in planning the new design for all India transport system must be to *serve maximum area within minimum linear mileage of transport and communication lines combined with utmost efficiency and precision.*

It is with these ideas in view that the schematic design of the federal transport system has been indicated in a *diagrammatic* manner against the outline of the accompanying map of India. A word of explanation is necessary before inviting the attention to the map or other diagrams. One would naturally feel surprised to see the proposed roads or railways in this map being represented by a series of horizontal and vertical straight lines. It is therefore essential to point out first that these maps are in the nature of schematic diagrams so that the individual lines in it only indicate the general direction of the proposed roads or railways without actually giving any details along its course. *They are, therefore, only indicative and not representative in their purpose.* Although for reasons explained later, due emphasis is given for keeping the new transport lines as straight as possible, need for minor deviations from the straight path to overcome natural barriers like hills, valleys, rivers etc., and such other common-sense considerations, is presumed.

One would also feel it strange that none of the existing roads or railways have been indicated in the schematic diagram. Reasons for this have been explained earlier and elsewhere in subsequent pages.

PRIMARY LINES OF FEDERAL TRANSPORT AND COMMUNICATION

Reference to the schematic map would indicate the position that should be occupied by the two primary lines of federal transport and communication. Since these primary lines have the importance of a back-bone in the general skeleton of an all-India system of transport, one can at once grasp the significance of the particular position assigned to them. One of these runs along west to east joining the ports Okha and Calcutta. The other runs South to North joining the southern-most point of India with Delhi (Kalka). Considering the general shape of India, these two primary lines of federal transport would coincide with the natural geometrical coordinates of the country in the direction of its land extremities. They will, therefore, serve to correlate the transport and communication services throughout the different parts of India in an adequate manner. Such a type of orientation of the federal primary lines will bring every part of the country within reasonable distance of the principal highway and thereby secure uniform distribution of transport and communication facilities throughout the length and breadth of the country. In the case of any form of living organism, the principal channels or trunk lines of nerves, arteries or veins are so orientated in relation to the general shape of the body and its appendages, that they provide easy approach to all the component tissues. It is on the basis of this analogy that the location of the two primary lines of federal transport has been suggested here.

For various reasons, port Okha deserves to be a major representative harbour along our western coast. For peninsular and central parts of India, it is the farthest land point penetrating the western waters and therefore, a very suitable and nearest point of contact for marine communications with Europe and other countries operating through the Suez. It has considerable advantage over Bombay in being 300 miles windwards during south-west monsoons. Roundabout in the vicinity of Okha, there are many more valuable natural harbours like Positra, Shial Bet, Bedi, Salaya, Sika, Kandla, Mandvi and others. Port Salaya is particularly important and has since long won distinction as the "Liverpool of the East."* The Marine Survey Department of the Government of India have critically surveyed this port several years ago and it has been

* Kathiawar Gazettier

recorded that the Salaya entrance has as great a depth at low-waters as the Mersey at Liverpool has at high-waters. It provides excellent shelter from all the prevailing winds and can be extensively developed so as to harbour all sorts of vessels. The port of Kandla, which the Government of India has decided to develop as a major harbour, is also important in some respects.

The primary line of federal transport and communication would join Okha in a straight westward path with our important ports in the extreme east such as Calcutta, Chandpur, Chittagong and others which are suitable for marine communications through the Pacific. This Okha—Calcutta primary transport system will run through a land belt which is extremely important from several aspects. This belt marks the transition region between two natural geological subdivisions of this country into Peninsular and Northern India. Throughout its length, this primary system of federal transport will cover one of our most fertile agricultural areas having special significance as the principal production centre for high grade cotton and other important industrial fibres like Jute. It would, therefore, be a very suitable zone for locating our textile industries. Raw materials available along western and eastern ends of this belt would permit extensive development of alkali, ceramic, optical and other basic chemical industries. Even more important is the fact that for the major part of its entire length, this primary system would cover a country which is rich in its mineral resources and especially key minerals like coal, iron, manganese, chrome, aluminium, mica and others which in many places lie in adjacent locations. It will be seen from the map that this line would make contact with our existing metallurgical centres like Tatanagar and there are enough potentialities so as to have many more such centres on either side of it throughout the major parts of its length. Indeed this entire belt would remain on the fore-front of our future industrialisation in view of the several suitable sites which it affords for location of a large number of basic industries such as automobiles, heavy machinery, industrial ferro-alloys, tools, textiles, minerals and others.

The Cape-Comorin-Delhi line, which is the second of the two primary federal lines, would serve, among other things, two important purposes :

(1) It will efficiently correlate the transport and communication lines of the whole of peninsular India with those of Northern India.

(2) It will serve to connect each of the federal ports and marine bases all along the eastern and western coasts with well coordinated transport system of the whole land interior.

(C) : SECONDARY LINES OF FEDERAL TRANSPORT AND COMMUNICATION

It will be seen from the map that our important major ports like Mangalore and Madras or Alleppy and Dhanushkoti on the western and eastern coasts lie almost opposite one another. This situation can, therefore, be utilised by connecting such opposite harbours on western and eastern coasts by means of a common secondary line of federal transport so as to feed the federal primary system. The Cape-Comorin-Delhi primary line would, therefore, be crossed in a transverse manner at intervals by the following secondary lines of federal transport and communication: (See Map),

TABLE II

Secondary lines of federal transport and communication feeding the Cape-Comorin-Delhi Primary federal system.

Name of the secondary line	Specific purpose served
1. Cochin → Alleppy → Ramnad Quilon → Dhanushkoti line.	Connects Malbar, South Nilgiris and Tamilnad with all India system of transport and communication (hereafter abbreviated as A. I. S. T. C.). Dhanushkoti-the nearest land point for marine communications with Ceylon.
2. Calicut → Palghat → Coimbatore → Tanjore → Nigapatam line.	Connects northern Malabar, Nilgiris and Tamilnad with the A. I. S. T. C.
3. Mangalore → Hassan → Bangalore → Madras line.	Connects south Kanara, Coorg and Tamilnad with A. I. S. T. C.
4. Marmgoa → Dharwar → Bezawada → Masulipattam → Cocanada line.	Connects south Konkan, North Kanara and Southern Andhra with A. I. S. T. C.

Name of the secondary line	Specific purpose served
5. Ratnagiri→Satara → Sholapur → Hyderabad→ Vizagapattam →Bombay→Poona line.	Connects Maharashtra (Kon- kan, Ghats, Maval or Malnad tracts and Desh) and Andhra with A. I. S. T. C.
6. Bombay → Nasik → Ellora → Chanda→Cuttack line.	Connects central Maharashtra, northern Andhra and Orrisa with A. I. S. T. C.
7. Karachi→Marwar → Kotah → Jhansi → Allahabad line.	Connects parts of Sind, Marwar, Rajputana, Central India and United Province with A. I. S. T. C.
8. Quetta → Bolan → Multan → Jacobabad→Delhi line.	Connects Baluch frontiers through Bolan Pass with A. I. S. T. C.
9. Dera Ismailkhan → Lahore→ Delhi line.	Connects Afghan frontiers through Shadikhak Pass with A. I. S. T. C.

In case of secondary lines of transport feeding the Okha-Calcutta primary federal system, their location is based on ports, mountain passes and foreign roads along the land frontiers, position of certain cities and towns of permanent importance, location of mineral deposits or presence of metallurgical and other centres. The following table gives a tentative list of various secondary lines feeding the Okha-Calcutta primary line of federal transport.

TABLE III

Secondary lines of federal transport and communication feeding the Okha-Calcutta primary line of federal transport.

Name of the Secondary line	Specific purpose served
1. Diu→Rajkot→Kandla line.	Connects the federal port of Diu and Kandla with the land interior and with the A.I. S.T.C.

Name of the secondary line	Specific purpose served
2. Dharwar→Satara → Poona → Nasik→ Chinchpada→ Baroda line.	Runs through the Malnad or Maval tract which forms a transition belt between the coastal line and the western high lands on the one side and the eastern plains on the other side. Connect the harbours of Goa, Ratnagiri, Bombay and Surat with the hinterland. Connects all the area covered by it with A. I. S. T. C.
3. Quetta →Bolan →Jacobabad→ Hyderabad→ Nagar Parkar → Suigam → Ahmedabad → Cambay line.	Connects Baluch Frontiers with A. I. S. T. C. through Bolan Pass; connects parts of Sind, deserts of Thar, low lands of Cutch and parts of northern Gujerat with A. I. S. T. C.
4. Peshawar → Multan → Marwar → Ahmedabad→ Cambay line.	Connects Afghan frontiers through Khyber pass, N. W. frontier provinces; deserts of Sind and Rajputana, Marwar and parts of Gujerat with A. I. S. T. C.
5. Shrinagar → Jammu→ Lahore → Amritsar→Ratlam→ Dhar line.	Connects Kashmir, Jammu, Punjab, Rajputana, and Central Provinces with A. I. S. T. C.
6. Peshawar → Chitral → Tirhut →Gilgit line.	Connects Afghan, Turkish and Russian (via Pamir and Altai) frontiers through Khyber and Dorah pass (altitude 14,800 ft. above sea level); connects the frontier roads going to Kabul, Persia (Via Herat), Turkistan (Via Bokhara and Samarkand) and Republics of Soviet Russia (via Pamir and Altai), with A. I. S. T. C.

Name of the secondary line	Specific purpose served
7. Peshawar → Shrinagar → Leh → Simla line.	Connects Kashmir, Swat, Ladakh, Simla hills and various mountain passes and roads leading to principal Indo-Tibetan trade route via Gartok and Jalung and also leading to Kashgar, Puli and Yarkand through Sinkiang Province of China.
8. Almora → Lucknow → Bera → Coonada → Masulipattam line.	Connects Tibetan Frontier passes and roads, United and Central Provinces and Andhra with A. I. S. T. C. Connects Tibet and China via Ladang, Tulakpa and Saki on the border of Chinghai province of China.
9. Benares → Vizagapattam line.	Connects parts of U. P., Bihar, C. P. and Andhra with A. I. S. T. C.
10. Khatmandu → Patna → Hazaribag → Dhanbad → Tatanagar → Cuttack line.	Connects Nepal and important parts of Bihar and Orissa containing mine-fields of coal, iron, manganese, mica etc. and metallurgical centre of Tatanagar with A. I. S. T. C.
11. Darjeeling → Punkha → Coochbihar → Calcutta line.	Connects Bhutan, Sikkim States, tea growing areas of Himalayan foot hills, upper and central Bengal with A. I. S. T. C.; leads to Indo-Tibetan principal trade route via Darjeeling, Chumbi valley, Nathu la pass, Phari, Shigatsi and Gyantse.
12. Coochbihar → Gauhati → Shillong → Dimapora line.	Connects upper Assam, Khasi and parts of Naga hills with A. I. S. T. C.

Name of the secondary line	Specific purpose served
13. Comilla → Chittagong → Sangaon → Haka line.	Connects eastern Bengal, Chittagong port and hills, and Burmese frontier roads with A. I. S. T. C.
14. Silchar → Aijjal → Imphal → Haka line,	Connects Manipur, Chittagong and Arakan hills along the Burmese frontiers with A. I. S. T. C.
15. Dimapore → Kohima → Imphal → Tiddim line.	Connects Assam, Naga hills, Imphal plains, Manipur and Arakan hills along Burmese frontiers with A. I. S. T. C.
16. Palel → Tammu → and Kohima → Hukwang line.	Connects Burmese frontiers through Arakan hills and Hukwang valley with A. I. S. T. C. This line can be extended to the frontiers of Burma and China upto Bhamo on the borders of the Yunan province in China thus providing the shortest and most convenient land route between India and China.
17. Chandpur → Dimapur → Digboi → Ledo line.	Connects eastern Bengal, Naga and Khasi hills, North-eastern Assam (mineral oil-fields) and roads leading to Tibetan and Chinese frontiers (Szechwan province) through Saikhoa pass with A. I. S. T. C.
18. Peshawar → Delhi → Patna → Shillong → Ledo → Saikhoa line.	Connects Afghan, Turkish and Russian frontiers, Himalayan foot hills all along the course through N. W. F. province to Assam and roads along Tibetan and Chinese frontiers with A. I. S. T. C.

It will be seen from the above tables that various secondary lines of federal transport are more or less parallel lanes spaced at convenient intervals so as to feed the two principal federal primary systems and thereby bring every portion of the country in a well coordinated scheme of inter-communication. It may be stated here that the above list of secondary federal routes is, by no means, exhaustive. It only indicates tentatively the procedure that may be followed. Many more secondary lines of federal transport can, therefore, be added to the above list after going into the details of the actual needs of the various regional units of the federation.

Some of the existing roads or railways can be accommodated in the above groups of secondary federal routes. Thus, for instance, the existing railway running between Marmgoa, Dharwar, Hubli, Gadag, Ongoli and Bezvada can be incorporated in the above scheme with some minor changes.

(D): TERTIARY LINES OF FEDERAL TRANSPORT

These are, mainly, the lines bordering the whole country along its land frontiers and marine coasts. These may be divided into three groups as shown in the following table;

TABLE IV

Tertiary lines of federal transport and communication.

Name Of The Tertiary Line	Specific Purpose Served
1. Chitral → Peshawar → Jacobabad → Karachi line.	Continuous line along the territorial transition receiving foreign roads from Afghan and Baluch frontiers, which will serve as feeders. Major foreign roads and mountain passes have been shown in the map.
2. Western coastal line.	This will secure continuous land connection for the federal marine bases along the western coast situated at major ports like Karachi, Okha, Diu, Cambay, Surat, Bombay, Ratnagiri, Marmgoa, Manglore, Calicut, Coc-hin, Quilon and the South-Cape.

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Name of the tertiary line	Specific purpose Served
3. Eastern coastal line.	Securing a continuous land connection for all the federal marine bases along the eastern coast situated at Tuticorin, Dhanushkoti, Negapattam, Madras, Masulipattam, Coconada, Vizagapattam, Cuttuck, Calcutta, Chandpur and Chittagong.

The major part of the eastern coast is already served by railway which can be incorporated as such into the federal tertiary system of transport. In case of the west coast only a part of it is served by railways. In spite of the difficulties associated with the western ghats, the entire western coast-line must be served with railways.

Reference to the map will indicate that while trying to keep the federal communication lines as straight as possible, they are made to touch almost all the cities of all-India importance. Intervals between successive secondary lines of communication have been adjusted so as to incorporate the major urban centres in the respective areas. This has necessitated some irregularity or lack of uniformity in the intervals between successive parallel lines of secondary federal routes which feed the two primary systems. This however, has been done as a compromise in recognition of the fact that in view of our existing mental bias in favour of the old cities and towns, any design for national transport system which does not treat these old urban centres as the primary reference points, is not likely to be considered as a practical proposition for some time to come.

If for reasons explained in details earlier we design the new transport system without any direct reference to the old urban centres, there can be another way of orienting the federal secondary lines. The two primary federal systems (1) Okha → Calcutta and (2) South-cape → Delhi are almost parallel to the natural latitudes and longitudes. Therefore, secondary federal routes feeding these two primary systems, can be located at fixed intervals of the degrees of latitudes or longitudes as the case may be. A uniform interval of three degrees (equivalent to about 190 miles) would be quite suitable. This will divide the whole area into 190 miles squares so that any place in the country will be within about 100

miles from the federal secondary highways. Such procedure for orienting the federal communication lines at fixed intervals of degrees of latitudes and longitudes has some obvious merits in its favour because (1) it will considerably simplify the initial survey work by providing natural landmarks as reference points the position of which can be easily ascertained, (2) intervals between successive feeder routes will be uniform and (3) the whole procedure will be far more systematic and accurate as compared to the alternative method of orienting the federal communication lines with reference to the old cities and towns. It will be seen from the map that federal secondary routes in Peninsular India connecting the federal ports with hinterland, cross the South-Cape → Delhi primary system at irregular intervals. Instead of this, we can have a secondary route crossing the primary system at a regular interval of 3 degrees of latitude (about 190 miles) which can join the federal ports by terminal deviations, if necessary, after they reach the eastern and western coasts. This procedure will of course be subject to limitations imposed by topographic barriers, availability of easy passage through the highlands of eastern and western ghats and other considerations. When the national transport and communication lines are designed in this manner so as to make them follow the latitudes and longitudes at fixed intervals, it will be obviously impossible to incorporate all the cities and towns directly in the new design. As repeatedly explained in details earlier, this need not be taken too seriously because all these cities and towns are already well served with our existing roads and railways which will be correlated or co-ordinated with the new communication lines at all the points wherever they will intersect.

Therefore, even if we design the new transport system by reference to latitudes and longitudes, we will still be able to incorporate the old urban centres in the new design, though in an indirect manner.

The general shape of India is such that its geometrical co-ordinates in the direction of extreme land points are almost parallel to the natural latitudes and longitudes. Our country is, therefore, peculiarly well suited for orientation of its transport and communication lines, so as to make them follow the latitudes and longitudes.*

* The author is deeply indebted to Mr. G. D. Daftary, ex-chief engineer to the Government of Bombay, for contributing his useful suggestions bearing on this particular point.

IV

COMPONENTS OF THE FEDERAL TRANSPORT AND COMMUNICATION SYSTEM

Each of the primary, secondary and tertiary lines of federal transport and communication discussed above and shown in the map include collectively, (1) roads, (2) railways, (3) tele-communication wire lines, (4) federal power lines, (electric grids) and (5) inland air-ways. Location of federal air-bases and marine-bases in relation to these transport lines has been indicated in the map. Problems connected with inland water transport (not included in the map) are also discussed along with the above alternative modes of transport.

(1) ROADS

The standard of roads under primary, secondary and tertiary lines of federal transport should be fixed by a well-organised body of experts. At least in the case of federal primary roads, there should be segregated lanes for heavy trucks, light cars, rubber and metal tyre vehicles, cycles, animal carts and special foot-paths for pedestrians. Each of these must be broad enough to permit unrestricted up and down traffic under proper regulations to reduce accidents to a minimum. These primary, secondary and tertiary federal highways may consist of 12, 8 and 6 lanes respectively, with reserved strips of land on either side for future lateral extensions.

Since all the regional lines of transport will act as feeders for the entire federal system the pressure of traffic will be heaviest along these federal lines of transport. Especially in case of national emergency, either roads or rails alone will not be able to cope with such heavy pressure of traffic. Therefore, at least in case of federal system, both roads and railways should run parallel to each other or, closely side by side. As stated earlier, mutual relation of roads and railways should be adjusted as complementary, either by means of an adequate method of taxation or by nationalisation of means of traffic both along roads and rails. Due to commercial motives and discriminating policy of the alien government in favour of railways, we have come to believe that

there is an inherent antagonism between roads and railways even under national government. In other countries, not only roads and railways but also other lines of transport run side by side and yet prosper under the fostering care of their own governments. As emphasised by the National Planning Committee in its report the entire transport system must be looked upon as a means of national development rather than as a commercial enterprise. The need for roads in addition to railways can very well be illustrated by the recent construction of Bombay-Ahmedabad road. Though there is already a railway running along the same line, this parallel road was constructed even during the pressure of war economy. We already have in India nearly 30,000 roads which run either parallel or closely side by side with railways.

Soil types in different parts of India are so varied that each tract has its own peculiar problems relating to road material or to the technique of their construction and maintenance. The All-India Board of Transport should, therefore, have road research laboratories located at various representative centres. As regards the different units of road construction machinery, such as, bull-dozers, tractors, trailers, crushers, cement-concrete or tar mixers, binders, road-rollers etc. maximum efforts should be made for manufacturing these simple machines in our own country instead of relying on imports. If we cannot produce crude machines such as these even now, perhaps we are not yet fit to take up the machine age. Let the home production of such simple and crude machines be the first lessons for our national self-reliance. The Tata iron works at Jamshedpur have already succeeded in manufacturing road-rollers. These attempts can be extended for producing other road constructing machinery.

The problem of road-side trees can be looked upon from its utilitarian as well as aesthetic aspects. Trees along the sides of these new roads can be planted in a carefully pre-planned manner so as to create a national arboricultural museum in which as many of our indigenous types of trees as permit of being grown along the road-sides, should be included. Some of the roads can be reserved for maintaining trees, imported from other parts of the world with due regard to ecological adaptability. Each type should have a continuous avenue for a certain distance and different species can be neatly arranged in the order of their scientific classification. This may help to do away with the monotony characteristic of long straight roads. These ideas may appear rather too visionary in our country though they are not unknown in other countries. If natural

science and other museums are systematically located along our new roads, even to travel along these roads would be an education in itself. In countries like Japan, road avenues, in addition to their aesthetic value, serve as important economic assets. Thus the well known *cryptomeria* avenue in Japan which extends continuously over 25 miles along one of the national high-ways is valued at 3,000,000 yens. Development of ribbons is one of the most troublesome features about our existing roads. Therefore, in order to avoid such ribbon development in case of our future roads, need for reserving broad strips of land on either side is generally appreciated. Until such reserved strips of land outside the avenue can be actually utilised for any future lateral extension of the new roads, they can be used either for cultivation or for growing some useful trees yielding fuel, timber, fruits, tannins, drugs, lac, rubber, and such other economic products. The plantation of trees in this manner along the sides of both roads and railways will also indirectly serve as an important large scale measure against the problem of soil erosion which is becoming serious in our country.

(2) RAILWAYS

At present our railways run on four different gauges which involves considerable waste of time and energy due to difficulties connected with the loading and unloading of waggons at each of the gauge junctions. Therefore, it is a matter of extreme importance to adopt a uniform gauge everywhere to avoid such waste. The importance of this problem can very well be brought out by the example of Australia where variation in gauges has so much affected the general efficiency of traffic management that their unification throughout Australia was one of the fourteen points in respect of which all the federal units were to delegate exclusive powers to the central commonwealth Government by means of a special referendum.

It is well known that transport of coal from one place to another for running our railways consumes a considerable portion of the total ton-waggon-miles of the entire goods traffic. In fact coal is the largest single item of goods traffic and although its freight charges are comparatively low, it accounts for 16% of railway earnings on goods traffic. As far as possible, therefore, the railway lines should be electrified so as to substitute electric locomotives for those working on mineral coal. Electrical locomotives carry more load with greater speed without much wearing the track and are, therefore, more economic. In view of our

limited reserves of mineral coal, such substitution is extremely essential. Even in countries like England with richest deposits of mineral coal, the supplies are getting deficient in quality and quantity and they have now to look for alternative sources for generating power. Indian deposits of mineral coal are too limited and at least in case of our country, to use it as a fuel can only mean irrational misuse of a most valuable raw material. There are innumerable articles which can be manufactured from the by-products of mineral coal which include dye-stuffs, drugs, explosives, insecticides, perfumes, flavourings, plastics, fertilisers and others. The smokeless solid fuel left behind after fractional distillation has the efficiency of more than 70% as compared to less than 15% of open coal fires. We must, therefore, devise some organisation for preventing the loss of all these important byproducts which are simply puffed in air through chimneys of railway locomotives, industrial factories or domestic kitchens. State regulations must make it compulsory to subject all the mineral coal or fuel wood to fractional distillation before it is released for consumption as fuel. Such a procedure will considerably stimulate the basic chemical industries, yield products similar to asphalt to surface our new roads, supply a part of the agricultural demand for nitrogenous and other fertilisers and release considerable quantities of sulphur, the key mineral for all industrial development in respect of which India is very much deficient. Indirectly, this will also help to make our industrial and domestic environment much more clean, comfortable and hygienic.

Some of the railways in Latin America have solved their fuel problem in an interesting manner which deserves our attention. They have introduced from Australia fast growing species of eucalyptus and other trees and maintained their plantation continuously along both the sides of the railway line. Due to the fast growth of the trees, the railways have become self sufficient in a very short time in respect of their requirements not only as regards the fuel but also other needs such as sleepers for the rails, poles for the telegraphs, timber for carriages and so on. By adopting some such method our railways may be able to meet considerable part of their requirements and relieve much of the pressure which they bring on our forest resources and limited coal reserves. Continuous plantation along the sides of the rails will give additional strength to the track and prevent it from being washed away during rains and floods. It will also add to the comforts of the railway journey, especially during hot weather, by providing continuous shade all along the line.

Buildings and other constructions at each of the railway stations along the new railway lines can be designed so as to represent the local architectural styles. Some of the existing railway stations along B. B. & C. I. railway line between Ratlam and Delhi have been tastefully constructed and have considerable aesthetic appeal. We can follow similar procedure all over India so as to represent the innumerable architectural patterns prevailing in different parts of our country. Railway stations in certain parts of India can be selected in an appropriate manner so as to exhibit the architectural styles prevailing in Burma, Tibet, China, Central Asia, Europe and other countries.

It has been pointed out earlier that too many deviations from the straight path unnecessarily add to the linear mileage of railways or roads without any corresponding increase in their utility as regards the extent of area served. Therefore, while surveying and laying down the land marks for the future roads and railway lines any such deviations from the straight course should be scrupulously avoided as far as practicable. Deviations should be permitted only in cases when topographic barriers such as hills, valleys and rivers are to be dealt with or when it involves encroachment on municipal or any other inhabited areas and thereby adversely affect the basic rights of individuals or groups. But after making due allowance for such reasonable expedients, these directions must be carefully maintained in a straight line at the time of initial surveys and deviations beyond a certain prescribed limit should not be allowed without the permission of the controlling board of transport. Also no deviations should be allowed in order that the federal lines along their course should touch a district or taluka town or some other city of provincial significance only. It should be the concern of the respective provinces to connect such cities with federal lines by means of their own regional lines of transport and the All India federal highways need not be deviated from their straight path for such reasons. One would like to criticise this point and wonder whether the roads are meant for the people or the people for the roads. But any such criticism would be based on lack of discrimination between the basic functions of the federal and regional transport system. The function of the federal system is to connect the different regional units and distant parts of the country as a whole while the function of the regional transport system is to connect their own cities, towns and villages, first among themselves, and then with the federal system. As explained earlier and indicated

in the map, we can have federal roads and railways reasonably straight and yet make them touch most of our major cities and ports of all India importance. But consideration of every minor city along its course will result in the federal lines taking a wavy, zig-zag path. A person going from U. P. to Madras, for instance, is interested in going straight along his way without being taken right or left constantly like a shuttle in the weavers loom. Therefore, such clearcut differentiation of the functions of the federal and regional transport systems will help us to make them both efficient in their own spheres of action.

This suggestion is in conformity with some of the most modern trends in the design of national transport systems. In fact one of the first things which Russia had done during the execution of the first five year plan was to make their old, wavy roads as straight as possible by removing all unnecessary curves and gradients. It would be relevant to quote here the following lines from Ilin's popular rendering, "Moscow has a plan."

"Look at the map. Follow the track all the way from Moscow to Novosibirsk. At many places the track curves and makes unnecessary turns. Why did they build it so? Who can tell now? In former times before the revolution, railways were constructed without any definite general plan. Each city sought to draw the track to itself. The track consequently twisted and wriggled, depending on which could pull hardest. Now the railways must be straightened; the mistake made by others must be corrected. See what tremendous circle the Siberian railway makes between Sverdlovsk and Kurgan. Why does it go to Cheliabinsk, when this city is altogether out of way? From Sverdlovsk to Kurgan a new direct road must be built....."

By such process of removing sharp curves and moderating the gradients, they brought Moscow and Siberia considerably nearer. The result was that more trains could move between the terminal points with much greater speed than before. This led to considerable economy in fuel and greater efficiency in mobilising men and material.

It is necessary to repeat here again that the straight lines on the map showing the proposed federal lines of transport are purely

* Ilin M : Moscow Has A Plan (English Translation) Jonathan Cape Ltd. London.

diagrammatic in nature and they are only indicative and not representative in their purpose. When it is emphasised to keep the proposed transport lines straight, it does not mean that the actual roads or railways should be kept perfectly straight with a sense of strict geometrical accuracy. For obvious reasons it is presumed that ordinary common sense considerations will make it necessary to have slight deviations on either side of the straight direction so as to overcome or bypass any geographical barriers or to meet other engineering and technical requirements. Therefore, as already explained, straight lines on the map only indicate the general directions of the proposed lines of transport without showing any such slight deviations along their course, which may be necessary for various reasons.

TELE-COMMUNICATIONS

All tele-communication services should be nationalised under the control of the federal Government. Other countries like England and U. S. A. are also moving in this direction. British Empire Tele-communications was a monopoly of Cable and Wireless Limited, which the present Labour Government wants to nationalise along the lines of G. P. O. During the recent war, U. S. A. has realised the importance and political utility of tele-communications and has some time ago established a Federal Communications Committee to deal with these matters.

Telegraphic and telephonic trunk lines should run all along the sides of the primary, secondary and tertiary lines of federal transport as indicated in the map. These would serve to coordinate the various intra-regional tele-communication units operating all over the country. Some of the suitable marine bases indicated in the map should be used as centres for marine cable communication. Even though many developments have taken place as regards radio-telephones and radio-telegraphs, ordinary wire and cable communications must retain their importance for considerable time to come. Beam wireless communications are faster and cheaper in initial capital outlay, operation and maintenance. But they are many times, unreliable due to fading of radio waves under certain conditions which cannot be controlled. Therefore, both tele-communication wires and wireless services are complementary and one cannot replace the other completely. For these reasons cable and wireless radio companies have formed mergers in other countries.

Radio services would occupy paramount position in the internal communication in view of the vast expanse of our country. It would also be a great asset for the development of rural areas. Future broadcasting services can be organised through three different classes of radio stations; (1) intra-regional, (2) inter-regional or federal and (3) inter-national. The regional stations should be located at each of the cross-points and terminus points of the federal lines of transport and communications as shown in the map, and should broadcast over short ranges in languages and dialects of the adjacent regional groups on matters of purely local interest. For all the regional units there should be a common medium-range transmitting station to deal with inter-regional or federal affairs, and which can be received clearly only within the territorial boundaries of the federal frontiers. Such a federal broadcasting station can be located in Central India at the point where the two primary lines of federal transport cross each other somewhere near Itarasi and Harda as shown in the map. In addition to the regional and federal transmitting stations, there should be specially powerful long range broadcasting centres which can be received anywhere on the globe. These should be located at south cape, Okha, Calcutta, Delhi and some other suitable places sending powerful beams of radio waves in their respective directions.

With such a clearcut division of functions among three different classes of transmitting stations, much of the existing congestion in the broadcasting services can be reduced and each linguistic group or even dialects can be individually attended to with efficiency. Progressive electrification of rural areas will enable us to give greater emphasis on rural broadcasting and community receivers. Weather forecasts can now be predicted with considerable accuracy within 48 hours and these can be of immense utility to agriculturists if they are available through rural broadcasts. In some Balkan States short wave transmitters operate between towns and adjacent villages. Such an organisation can be evolved in our country also. All transmitting stations should be inter-connected through special telephone circuits and also equipped with directional aerials and other means for relaying the programmes. There should also be arrangements for training technicians in radio engineering and research facilities in radio physics, atmospheric and related subjects.

At each of the cross-points and terminus points of the federal lines of transport and communication, there should be postal

centres for assortment of postal articles and tele-communication messages for adjacent regions. Tele-Printing equipments and editorial offices of the local news papers, magazines, journals and other periodicals should also be located at each of these points. The present inland news service must be reorganised on systematic and extensive basis. We must also have a foreign news service of our own operating on the lines of Reuters, A. P. A., or Tass. Most of these services are not inter-national in their outlook as they ought to be. They simply act as instruments for their respective national interests. As a result of this situation, the foreign news which we get is often not the fact but what others want us to believe.

Associated Press of India, a Reuter's subsidiary company, which for the last 50 years collected and distributed the Indian news, has been recently transferred to the ownership of the Press Trust Of India Ltd., a newly created organisation co-operatively owned and managed by the Indian newspapers as a national internal news agency. The Press Trust Of India has also become a partner in the ownership of the Reuters international news agency. However, this does not appreciably improve the position of India in the sphere of international news and it involves undesirable alliance with one of the power groups in the world politics. We must have our own independent news service operating in different parts of the world until there is a genuine international news service jointly organised and operated by all the nations of the world. In view of the importance of international news in the formation of correct public opinion, existing world organisation like U. N. O., if reconstituted on purely democratic lines, can operate such international news service.

FEDERAL POWER-LINES

After the modern improvements in the methods of transport and distribution of electric power, the electric grids have become one of the component parts of the national transport system. The design of national grid lines thus shares many features in common with that of roads and railways, and is, therefore, discussed in short here.

A continuous system of electric grids should run all along the sides of the federal lines of transport and communication as indicated in the map. This federal grid system will serve to rationalise the distribution of electric power so as to make it available in

every part of the country. It can link together and coordinate all the sources of generating electricity. Together with hydro-electric stations, the federal grid system can incorporate in itself all types of thermal stations utilising mineral coal, wood or charcoal, mineral or vegetable oils, synthetic power alcohols, combustible gases and other miscellaneous fuels.

Soviet Russia used even dried marshes and peats for generating electricity and also utilised for this purpose, wind mills specially designed at the Aero-hydraulic Research Institute, Moscow, on a large scale. The first five year plan provided to raise the strength of wind mills alone to 5,00,000 h. p. They generated electricity even from solar radiations and oceanic tides. The best instance of large scale tidal-power station is the recent Severn-barrage-project published by the ministry of fuel and power in England. A dam across the river Severn would impound sea-water at rising tides which will be made to flow over turbines during the succeeding fall. There would be two such periods of seven hours each during every 24 hours during which plant would generate electricity, the output varying according to the intensity of tidal waves. These daily and seasonal changes in output will be balanced by incorporating it in the national grid system of England. The gross energy of this tidal power station would save about one million tons of coal per year. Along the vast coastline of India, there are innumerable sea inlets, creeks and river mouths, where we can have such tidal power stations.

India has vast possibilities for development of electric power. Her potential hydro-electric resources alone are estimated at 27 mkw. But competent authorities consider this to be a "gross under-estimate or only an intellectual guess." As an example of difference between rough guess work and actual surveys instance of U. S. S. R. has been cited* Hydro-electric resources, of U. S. S. R. during post-revolution period were estimated at 14 mkw. only but the actual survey carried out during the first five year plan raised this figure to 240 mkw. A critical all India survey is therefore necessary before we can actually estimate our potential hydro-electric power. Most of the rivers in India have seasonal variations in their flow. They would not be able to take the full load all the year round except in combination with thermal

* Saha M. N., Nature 155 (3930) 221.

and other types of power stations. Experience of the Ganges Canal Power Scheme in U. P. would indicate that a scientific combination of hydro-electric and thermal stations is most economic.

Our deposits of mineral oil are very limited but this deficiency is compensated for by large output of vegetable oils and other raw materials for producing power-alcohols and other synthetic fuels. There is great need for devising suitable methods for the utilisation of vegetable oils as machine fuel. Under the pressure of petrol-shortage during war, China has made considerable advance in the technique of cracking vegetable oils for machine use. This will have great utility especially for rural electrification for operating agricultural machinery and implements. Besides all these raw materials there is an unlimited scope for the utilisation of energy from wind, water and sun.

Great advances have been made in cheap distribution of electricity by improving the design and operation of individual power-houses and coordination of generating plants by means of national grid system. In countries like Sweden with high standards of hydro-electric developments, networks of all the major power plants are inter-connected through four heavy copper and steel-aluminium transmission lines stretching from extreme north downwards throughout the entire length of the country. These constitute the main arteries through which the railways, industries and house-holds are supplied with power. In England, electricity has been nationalised long ago under the special Electricity Acts of 1919 and 1926 which established the national grid system controlled by the Central Electricity Board. Under the Act, electricity generated by private ownership is to be sold and contributed to the national grid system and repurchased for their own consumption from the common lot. The State acts as the sole medium for controlling the transmission and distribution of both private and national sources of generating power so that all the individual power stations have become available generally instead of locally. Energy generated at one place can be utilised at any other point through the medium of grid and this results in considerable economy of fuel. It has increased the thermal efficiency by 15% and one ton of coal can now produce as much electricity as 2.2 tons in 1920 which amounts to a saving of 55% on fuel. Even though grid equipment involves considerable initial expenditure, the subsequent saving in recurring items more than compensates for it. In the

annual session of Indian Science Congress, 1945, it has been pointed out that "generation, transmission and distribution of electric power must be studied and dealt with on a nation-wide basis and not from the point of view of provincial interests. there is nothing to be afraid of; ultimately it is for the good of the country as a whole. Higher the load factor on a system, more effective is its working. Large network constructed by a national authority is the best means of obtaining the most effective conditions of working." In view of such technical considerations electricity is progressively being managed by the Central Government in most of the advanced countries. State ownership of the British Grid System is one of the major public services which are scheduled for reorganisation by the Labour Government now in power. This would explain the significance of the Federal Power-lines as suggested here. In this connection we must welcome the formation of the new Statutory Corporation called the Central Electricity Authority formed under the special act of 1948 by the Federal Government.

The National Planning Committee has recommended separate Electricity Boards for the centre and provinces with their own organisations for generation and distribution of power. We can have two systems of electrical grids the (1) federal, and the (2) provincial, mutually co-ordinated at suitable points. The provincial grids can distribute power for lighting, household and municipal requirements, cottage industries, consumers goods industries etc., and for running the provincial transport such as tramways, guideways etc. Federal grid system will be necessary for working all the railways, factories and workshops connected with basic and large scale industries, mining, metallurgy, automobiles, shipbuilding aeroplanes, heavy machinery, tools, basic chemicals, ammunition, armaments and all other industries, which will be nationalised, controlled and operated by the federal authority. As regards the availability of power to be transmitted through the federal grid, there should be a legal provision under special federal act whereby electricity generated in each of the provinces by making use of hydroelectric and other natural resources should be equally shared with the federal government by contributing 50% of the provincial electrical output to the federal grid. Federal Electricity Authority may also contribute its surplus electricity to deficit provinces. The Federal Authority can, in addition, have its own power stations using hydroelectric, thermal, atomic and other sources for generating electricity.

Countries like England with relatively small area can have a unified grid system covering the whole country but this will not be possible in the case of India with its continental size and vast distances. Therefore, instead of a single grid system covering the whole area, we must split it into four or five sectors covering a manageable area of territory. It will be seen from the map that the two primary lines of federal communications (1) Okha → Calcutta and (2) South Cape → Delhi, divide the whole of India into four quadrants. We can have a separate federal grid for each of these four sectors which may be mutually co-ordinated at suitable points if necessary. Such division of India into four sectors will be most rational in view of common geographical features and identity of problems relating to the generation and distribution of electricity. Thus in the case of sector (1) formed by Okha → Itarasi → Delhi line of primary federal communication system, most of the hydroelectric resources would come from western Himalayas, Vindhya and other highlands as also the 5 rivers of Punjab with their tributaries. Projects in this region will have to combine electrical generation with irrigation extending over vast low-rainfall, semi-arid or desert areas of Punjab, Rajputana, Sind and Tharparkar which require reclamation and systematic cultivation. In the case of sector (2) formed by Calcutta → Itarasi → Delhi line, hydroelectric resources will come from eastern Himalayas and adjoining hill tracts as also from the Ganges and Brahmaputra river systems with their innumerable tributaries and other small rivers opening in the Bay of Bengal. All this area consists of thickly populated fertile alluvial plains with abundant rainfall and rich agricultural, industrial, mineral and other resources. In the case of sector (3) formed by Calcutta → Itarasi → South Cape line of Primary federal communication, there are few highlands and hydroelectric resources would mostly come from the four major rivers in the region; Mahanadi, Godavari, Krishna and Kaveri including their tributaries and other minor rivers opening along the eastern coast. There can also be innumerable tidal power station, all along this coast. In the case of sector (4) formed by South-Cape → Itarasi → Okha line, hydroelectric resources will come from Narmada and Tapi rivers with their tributaries, minor rivers opening in and around the gulf of Cambay, rivers originating in the western ghats and running over its slopes on either side; artificial water catchment areas and reservoirs constructed at suitable points in the western ghats and tidal power stations all along the western coast.

It will thus be seen, that having regard to the nature and distribution of hydroelectric resources, division of the federal grid into such four sectors or regional zones, constitutes the most rational procedure. Such division into four regions also coincides with the uniformity in each region as regards the topography, hydrography, soil, rainfall, climate, agriculture, industrial resources, relative density of population and other features.

Various provincial grids can be designed in such a manner so that each of them will serve as a smaller component unit of one of the four federal grids operating in the four sectors or regional zones as explained above.

FEDERAL AIR BASES AND INLAND AIRWAYS.

Reference to the schematic map will indicate the proposed federal air bases which have been located at each of the cross points and terminus points of the federal lines of transport and communication. They are also located at each of the federal marine bases indicated in the map. This type of location will therefore ensure complete coordination of air services with every other mode of transport and communication over land and seas. As a result of such location of the federal air bases, the federal lines of transport indicated in the map will also represent the general direction of the inland air routes. All the federal lines of transport should, therefore, be equipped with a continuous chain of airway beacon lights about 25 to 50 miles apart, as one of the aids to night flying. In the above manner there will be about 80 to 100 federal air bases evenly distributed all over the country thus leading to balanced regional developments as regards the aviation facilities. These federal air routes can be coordinated with the regional departments of aviation which may be independently financed and operated by each of the regional units within their own territorial limits. Air communications can be extensively developed in regions such as western ghats, frontier high lands and the various Himalayan states, where due to peculiar topographic conditions, surface transport cannot be developed adequately. Every district and taluka town must be provided with landing facilities. This will secure feeder services for the federal air lines while giving stimulus to civil aviation or private flying and gliding clubs.

Each of the federal air bases should be provided with all the equipment on modern standards, including facilities for training in

all the branches of aviation, research in aeronautics and engineering centers for assembling the prefabricated components of aeroplanes, meteorological and weather forecasting stations, and other elaborate ground organisation.

In addition to attending to inland services, the federal aviation department must also participate in all the international air routes by securing full reciprocal rights and agreements with other countries.

FEDERAL MARINE BASES.

Position of the federal marine bases indicated in the map will show that about 27 of our natural harbours of long standing reputation have been selected for this purpose both along eastern and western coasts. Out of these, more important ports like Karachi, Okha, Kandla, Salaya, Diu, Bombay, Mormbgoa, Manglore, Cochin, Dhanushkoti, Madras, Vijagapatam, Calcutta, and Chittagong can be developed as major national harbours of first order. Other ports like Mandvi, Navlakhi, Bhavnagar, Broach, Surat, Ratnagiri, Bhatkal, Travancore, Tuticorin, Masulipatam, Cuttack, Chandpur, and some others can be developed as auxilliary federal ports of secondary importance. Besides these, the coastal provinces can develop their own minor ports suitable for country craft and small power-boats, which they can use for coastal trade, fishing and for operating feeder services between federal ports. It must be investigated by undertaking critical coastal surveys, whether there are any additional sites for opening new natural harbours.

Some of the major ports in India are at present administered by their own separate port trusts. This involves considerable amount of overlapping and lack of uniform co-ordinated policy from an all India point of view. Therefore, instead of having a separate port-trust for each port, there should be a central organisation administering all the federal ports and marine bases according to a systematic unified plan. This may be done either directly by a separate department of the federal government or through a statutory authority specially created for the purpose.

It will be seen from the schematic map that all the federal marine bases are located at the terminus points of the federal transport lines running throughout the land-interior and each of these federal marine bases have shortest land connections with

each other through the tertiary lines of the federal transport which runs all along the coast. As pointed out earlier, each of these federal marine bases have been provided with an air base. This arrangement will, therefore, ensure complete coordination of inland, marine and air transports. Even distribution of these 27 or more marine bases along the entire coast line should secure for every portion of both peninsular and northern India, the shortest access to a federal port for the purpose of overseas exports and imports.

Shipbuilding and other coastal industries can be subjected to well-organised decentralisation so that the federal yards at the marine bases should only serve as centres for assembling the prefabricated component parts. Heavier items can be manufactured in close proximity of the assembling centres and lighter items can be produced at more distant places. Due to unfavourable agricultural conditions, major parts of the coastal belt are characterised by annual migrations elsewhere in search of employment. Decentralisation of new coastal industries will, therefore provide cottage industries to the people in their own environment.

At each of these federal marine bases, there should be separate spacious dockyards for exports and imports with a federal customs house in the centre. There should also be a shipbuilding yard, berthage and dry dock facilities, a naval college for training technicians and personnel expert in naval architecture, engineering, marine trade and war-time defence; a federal research station for oceanography, marine fisheries, and marine hydrobiology to investigate the oceanic floras and faunas from both theoretical and practical aspects, and many other allied activities.

INLAND WATER TRANSPORT.

Inland water transport has special advantage over roads and railways in respect of capital expenditure, operational ease, and carriage capacity. Natural waterways, however, do not run as we want. The vast alluvial plains of northern India are more favourable for water transport as compared to peninsular India with its rugged mountainous tracts. The Indus, the Ganges and the Brahmaputra are navigable for considerable distance upstreams as far as Dera Ismail Khan, Kanpur and Dibrugadh respectively. It has been estimated that these river systems of northern India provide about 26,000 miles of waterways all the year round, either by steamers or by small country craft. In peninsular India, the Narmada, the Tapi, the Mahanadi, the Godawari, the Krishna and others are navigable for

short distances only. As early as 1872, Sir Arther Cotton, the architect of the Kaveri and Godawari works, proposed a scheme for inland water ways from (1) Calcutta to Karachi up the Godawari and down the Indus; (2) Cocanada to Surat, up the Godawari and down the Tapi; (3) Masulipatam to Karwar, up the Krishna and down the Tungabhadra; (4) Up the Ponnag, by Palghat and Coimbatore. Total capital outlay was estimated at 30 million pounds. However, this ambitious scheme could not be put into execution due to opposition mainly on the part of vested interest of the railways. Effects of railways on other alternative modes of transports have become still more acute since the commencement of railway profits in 1900. The Ackworth Committee, in 1920, have pointed specifically how some ancient ports like Broach and Buckingham canal in Madras have suffered due to unfair competition on the part of railways. Industrial Commission had recommended the formation of Waterways Trust and expressed the need for harmonious working of the railways and waterways where their activities overlap. In U. S. A., Europe and other countries, both flourish together under proper administrative adjustments.

Most of our old ports situated at the river mouths such as Broach, Surat, Masulipatam etc. have deteriorated and gone out of use due to the accumulation of sediments. If these are reconditioned, they will give considerable stimulus to development of inland water transport. By providing marine outlets for inland water transport it will also stimulate feeder services for the marine bases and federal ports. River systems of both peninsular and northern India can serve as important waterways if systematically improved and canalised. By designing and standardising special types of small vessels, motor boats and country craft so as to suit different grades of water lines up-streams, these facilities can be considerably extended. Canalisation of rivers can in many cases be combined with irrigation and hydroelectric projects as in the case of Buckingham canal or Ganges canal. Inland waterways have special significance for mobilising our forest resources and agricultural products.

In order to develop inland water transport facilities, an elaborate programme of river training must be undertaken. This will include the reclamation of river side gullies, swamps, marshes and dilations; removal of convex or concave sides and sharp curves; regulation of unstable sand banks by means of parallel dykes; elimination of midstream rapids, rocks, islands, shoals and loops, modera-

tion of angle of confluence and reduction of width at the river mouth. All these measures will secure uniform velocity of current so as to prevent further deposition of silt and the natural action of low and high tides can flush away the sediments at the mouth thus keeping it open for navigation.

By means of artificial canals, rivers can be interconnected at points where they approach each other. All inland water transport lines should be equipped for night traffic and telecommunication services. There should be ship building and repair shops, loading, unloading devices, store houses and other facilities provided at suitable intervals. Inland watercraft including fishing boats should all be standardised for size, carrying capacity, design and equipments into convenient classes.

Rivers are seldom confined to one state and have no regard for provincial boundaries. Use of flowing waters, therefore, involves many interprovincial conflicts and other problems. Thus, for instance, such conflicts are known to exist between Sind and the Punjab, the United provinces and Bengal; Bengal and Assam; Hyderabad, Mysore and Madras for the utilisation of the Indus, Ganges, Brahmaputra-Meghna and Tungabhadra rivers respectively. The last of these cases is specially illustrative of how such conflicts prevent any progressive enterprise to exploit the natural resources in view of the fact that the Tungabhadra project was shelved for 50 years due to lack of any agreement among the three regional units concerned. In the case of the Indus and Gangetic systems, discordant policies pursued by the different provinces along their course, according to their own divergent interests, have given rise to serious problems connected with floods, erosion, deforestation, reduction in dry weather flow, spread of malarial diseases, serious interference with the natural flood irrigation of alluvial deltas, deterioration of navigational channels and inland water transport facilities. It should, therefore, be a general rule that utilisation of any water streams running through more than one regional units, should be under the administrative coordination of the Federal River Board. The Interprovincial Flood Conference held at Lucknow in 1939 has already accepted the principle of federal control in such matters to be exercised in a manner similar to that adopted by the Tennessee Valley Authority or Mississippi River Commission. Projects like T. V. A. could only be executed through willing cooperation of all the federating units concerned. A considerable measure of such cooperation has been already

secured for the Tungabhadra, Kosi and Damodar valley projects which have been recently undertaken.

In addition to regulating inland water transport facilities, the Federal River Board can attend to the following affairs: Control of floods, erosion and deforestation; planning of afforestation, and soil conserving agricultural practices for the river-side areas; inland fisheries and fresh water biological research; hydrodynamic and related research; construction of bridges, culverts, dams, irrigation channels and hydroelectric projects; river sanitation, creation of public recreational parks and preservation of wild life through proper conservation of the local flora and fauna.

V

REGIONAL SYSTEM OF TRANSPORT AND COMMUNICATION

Regional transport system should consist of primary, secondary and tertiary lines. Regional primary lines should connect the district places with the nearest lines of federal transport. Regional secondary lines should connect each of the taluka places with their own district centres. Regional tertiary lines should consist of minor roads connecting each one of the villages with their respective talukas.

Two alternative designs: The schematic diagrams A and B represent the two alternative designs for the lay-out of the regional transport system. In the case of diagram A it is presumed that existing districts and taluka towns should continue to have their present importance as provincial administrative centres, in executing the future reconstruction programme and for locating the various improvements and amenities to be made or provided under it. In the case of schematic diagram B there is a suggestion that the administrative and other functions of the new reconstruction programme should be located, not at the existing district and taluka towns, but at some other more suitable places, easily accessible for the adjacent rural areas, each of which may serve as a nucleus for the future development of a new urban centre in due course of time. These new reconstruction centres can be systematically located along carefully preplanned lines of transport and communication, in such a manner that they will create an even and well balanced distribution of the new urban centres against the predominantly rural background of our country. While administrative functions of the reconstruction should be located at these new urban centres, some of the old administrative activities in connection with revenue, judicial, police and other departments may continue to remain where they are in the old district and taluka towns.

This suggestion of shifting the administrative activities to new places instead of locating them at the old towns as usual, would appear rather strange or perhaps ridiculous. One may even recall the memory of the well known king* in our history who was fond

*Muhammad Bin Tughluq, 1325-1351.

of changing capitals too often according to his moods and whose eccentricities on this account have become almost proverbial. It may, however, be realised that this suggestion has something in it to deserve serious consideration.

Unbalanced Urbanisation: Relative distribution of rural and urban areas is exceedingly unbalanced and inadequate all over India. This has very drastic effects on the basic agrarian economy of the land. Due to uneven concentration or localisation of urban centres, vast areas are left in purely rural conditions without any easy access to urban facilities. All rural areas must have urban centres within reasonable distance to effectively absorb their agricultural commodities and to meet their requirements as regards marketing, medical aid, education, entertainments, cultural contacts and other amenities of life. But due to considerable lack of any such facilities, vast rural areas exist as economically dead patches profusely scattered all over the country. Even in the case of most fertile land under the best method of cultivation, agricultural pursuit becomes unprofitable under our existing conditions as regards the relative distribution of rural and urban areas. This situation may also partly account for the existence of vast areas described as "cultivable wastes". All improvements in agriculture which we envisage under the new reconstruction, may not yield their expected results unless by some arrangement, we rationalise the distribution of urban centres against the predominantly rural background of our country.

District and taluka towns are the principal urban centres in provinces. They have very little industrial significance and their importance is mostly due to location of British administrative machinery such as revenue, judicial and other offices, police force and prisons, as a result of which a comparatively large population has flocked together in an ugly and insanitary environment. Many of these old towns do not as yet have even such simple amenities as a good high school, a well equipped hospital, a decent library or a theatre and even if some of these facilities exist, they are in the nature of apologies and leave much to be desired according to present standards. If at all we have yet to start anew with such simple basic improvements, why not locate all these facilities in a manner whereby they will be easily and effectively available for the vast population scattered in innumerable villages? There is no reason why all such facilities should be piled at the old towns at the cost of 90% of the population staying in villages.

Territorial boundaries for administrative jurisdiction of existing districts and talukas have been laid down in an arbitrary manner during progressive accession of new territories under the British rule. Due to such historical process of growth, they are unnecessarily undulating and confusing. These boundaries have no relation to natural, geographic, linguistic or cultural homogeneities. Worst of all is the fact that in many cases, the district or taluka towns are not suitably located so as to be easily accessible for all the villages under their jurisdiction. People from some of the villages have to walk for miles together to go to these towns for purposes connected with revenue, litigation, marketing or social contacts. The size of many of the districts is too bulky for administrative convenience. Very frequently we read in Govt. gazettes, several changes being made every year in different parts of India by way of shifting district or taluka administration from one place to another or rearrangement of their territorial boundaries. If such changes could be effected even under the unprogressive foreign rule, should it not be possible to do the same under our own government as a part of a comprehensive programme of national regeneration? In fact, what has been suggested here is not even so drastic a change as this. All that is suggested here is that the administrative functions of the new reconstruction and amenities to be provided under it, should be located at some suitable places easily accessible for all the villages, whereas old administrative functions connected with the revenue, courts, prisons etc. may continue to remain where they are without any change.

It is thus evident that the urban status of most of the district and taluka towns is more apparent than real and even their territorial boundaries of administration require to be reorientated. Moreover, all these old towns are already well served with our existing old roads and railways. Therefore, in designing the new regional transport system, main attention should be focussed on villages instead of giving undue importance to the old towns.

The recent merger of Indian States with adjacent provinces has necessitated the redistribution of the district and taluka boundaries. Instead of demarcating the new districts in a haphazard manner, we can do it in a rational and systematic way. We must give careful thought to the problems as to the optimum size, suitable shape and nature of boundary lines of the new districts and talukas. Regarding the size, the analysis of the figures for area in square

miles of about 300 existing revenue districts in different provinces and States in India has shown that size of individual districts vary over a wide range from less than 1,000 to over 18,000 square miles. The modal value within this range corresponds to about 3,000 to 5,000 square miles. The size of our new districts may therefore, be adjusted so as to approximate this modal value. As regards the shape and boundary lines, the new districts need not be demarcated into clumsy odd shapes with wavy undulating and confusing boundary lines. There is no reason why our new districts should not be cut into neat rectangular or square blocks with almost straight boundary lines, as far as topography can permit, in the same way as the mosaic arrangement of rectangular counties demarcated in some of the newly colonised countries like U. S. A. or Australia. For the Indian conditions, a few years ago, this proposition would have been thought of as an absurd and unpractical one. But after the recent merger of the Indian States and the possible reorganisation of provinces which would necessitate reorientation of the district boundaries, it would be perfectly rational to follow such procedure. There must be a systematic rectangulation of not only the district and taluka boundaries but even the individual survey numbers and agricultural holdings if at all we desire any improvement in our existing methods of agricultural tillage operations and farm management. Design B is based on this idea of rectangulation of the boundaries of the districts, talukas and smaller territorial administrative units.

If the regional transport system is designed with main reference to old district and taluka towns, we will have a profuse network of undulating roads as roughly indicated in the schematic diagram A. For reasons given earlier, this will unnecessarily increase the linear mileage of roads, railways, telecommunication wires or electric power lines. If the regional transport system is designed according to diagram B, which does not take into account the existing old roads or district or taluka towns as initial reference points, the same area can be served within much less linear mileage of transport and communication lines combined with greater ease and efficiency in operation. In the case of design A, we will simply construct roads connecting villages with the old district and taluka towns; but it will not serve to remove regional disparity in rural-urban relations. In the case of design B, by locating the new industries and various other improvements under the reconstruction at suitable points along the transport lines, we can create well balanced distribution of new urban centres against the rural background. Therefore, the

adoption of design B may offer an opportunity for rectifying our existing unbalanced urbanisation. Design B is particularly well suited for electrification of rural areas in a most economic and efficient manner. The same degree of operational ease and efficiency can never be secured if design A is adopted. The costliest item in electrification is the over-head transmission lines. Adoption of design B will enable to serve maximum area with minimum length of transmission lines. It will also enable to have a systematic and well distributed location of individual loads. In view of the need for decentralising our industry in rural cottages, this is the strongest reason for adopting the design B.

Diagram B represents in a schematic manner a tentative arrangement of primary, secondary and tertiary lines of regional transport, on a territorial unit of convenient size (3,000 to 5,000 square miles) which may for the sake of convenience in expression be referred to as a new *Reconstruction District* in order to distinguish it from our existing old *revenue districts*. If topography of land permits, this should be roughly in the form of a rectangular block of about 100×30 miles. Irrespective of the territorial boundaries of the present revenue districts in provinces or the amalgamated states, such blocks of new reconstruction districts should be marked out like a regular mosaic pattern within the areas enclosed by the federal lines of transport (diagram C). This would resemble the manner in which individual counties are marked out within the territorial boundaries of each of the states in U. S. A. The shorter side of about 30 miles of these blocks should lie along the federal line of transport so that every reconstruction district in the mosaic pattern will have direct contact with the federal system of transport and communication (diagram C).

As indicated in the schematic diagram B, from the centre of the shorter side of each of these reconstruction district blocks, there should run the regional primary line of transport. The regional secondary lines of transport should cross this primary line in a transverse manner at regular intervals of about 20 miles. This will divide the "reconstruction district" into five equal areas, each of which may similarly be described as "reconstruction talukas" for the sake of convenience in expression and to distinguish it from our existing revenue talukas. Within each of these R. taluka blocks regional tertiary lines of transport should be laid as parallel lanes about 5 miles apart, without any reference to individual villages as shown in the diagram B. This will bring these regional

tertiary lines within about 2 miles from *any* of the villages *wherever* placed within the area of the R. district. This practically amounts to combing the whole country by means of these regional tertiary lines of transport regularly spaced about 5 miles apart so as to bring every village within about two miles from the well coordinated unit of all-India transport and communication. Individual villages can be connected to regional tertiary lines by means of minor approach roads which the villagers can construct through organisations like village panchayats or local boards.

Intervals between the successive regional primary, secondary and tertiary lines of communication has been tentatively adjusted as 30, 20 and 5 miles, respectively, in the design B. Desirability of locating the federal transport lines with relation to the latitudes and longitudes has been emphasised earlier. The same procedure can be followed in orienting the successive primary, secondary and tertiary lines of regional transport at the appropriate intervals of degrees, minutes and seconds of the latitudes and longitudes.

Since the design B will have the effect of combing the whole tract by means of regional tertiary lines of transport, at the interval of 5 miles, it is evident that it must also bring any of our old district and taluka towns within two miles from the all-India transport system as suggested here. Standard of even regional tertiary roads may be much better than the existing condition of our present district and taluka roads, with which these towns are already well served. Therefore, all the old towns, in addition to being served by our existing old roads and railways, will also be effectively incorporated in new design. It will thus be quite clear that, in constructing the provincial roads according to design B even though we do not start with the old district and taluka towns as primary reference points, in the ultimate analysis, it will still have the effect of adequately incorporating all these old towns in a well coordinated system of all-India transport.

The positions of the new district, taluka, and sub-taluka reconstruction centres have been indicated in the schematic diagram B. Location of the various stages in agricultural, industrial, educational, medical and other items of reconstruction activities, has been described in greater details later. Each of these reconstruction centres is intended to serve as a nucleus for future development of an urban centre in a systematic and preplanned manner. As regards the relation of these new urban

centres with our old district and taluka towns, it will be evident from the schematic diagram B that their distance would in no case exceed by more than about 10 miles. In view of this fact, the new urban centres proposed here would be in the nature of extensions in their relation to the adjacent old district or taluka towns, wherever they may be situated. This arrangement would not, therefore, involve any serious dislocation in the existing functions of these old towns, as might appear at the first sight. We are aware of the recent decision of the Orissa Govt. to shift its capital to Bhubaneswar, about 9 miles away southwards. The new capital will thus be an extension of the old one. The new urban centres for locating the reconstruction activities which have been suggested here as a part of the design B will have similar relation with the old district and taluka towns. Such change in location or a shift over a short distance has several advantages associated with it which are discussed later in detail.

It must be pointed out that what has been suggested here is only a schematic outline for the design of regional transport. This may have to be modified or adapted in different regions according to their special topographic and other features. Thus, for instance, it may be possible to have regional transport system according to design B in flat open countries such as the vast alluvial plains in northern India or black soil and other flat areas in peninsular India. But in areas such as the Western Ghats or the Himalayan states, it would be obviously impossible to reproduce this design with geometrical accuracy and the local transport system in such cases must evidently be designed with due relation to natural passages which may be available in these highlands. Therefore, in proposing the design B, all such limiting factors have to be presumed. It is neither intended nor possible to repeat the same pattern for regional transport system like regimental barracks. It is evident that the conditions over the vast subcontinent of India are too varied to permit any such over-simplification. In fact a design for the regional transport in each of the regional units would be a separate problem by itself. The purpose of the design B is only to indicate a rough framework.

A regional primary line should consist of a railway augmented by a road if pressure of traffic makes it necessary. These railways along regional primary lines will bring any of the villages, wherever placed, within about 10 to 15 miles from the all-India railway

system. Regional secondary lines of transport should consist of a broad spacious road with regular tramways or truck services operated by the Regional Board of Transport. Similarly, along the regional tertiary roads, there should be regular motor buses, freight car services or guideways maintained by the regional board. Distance between individual villages and R. taluka centres would be so small that our old bullock cart may or should continue to run along the regional tertiary lines and minor village approach roads without seriously affecting the general efficiency of the national transport system. Thus along with the gradations in the regional lines of transport such as primary, secondary and tertiary lines, there would be corresponding gradations in the modes of locomotion along the respective lines such as railways, tramways, guideways, trucks, buses, freight cars and bullock carts, each operating within the limits of its own well defined sphere of activity in a well co-ordinated manner.

It is estimated that India has more than one crore of bullock carts which present one of the greatest problems in road-maintenance and yet they cannot be easily dispensed with. The Indian Road Congress has been considering the problem for several years and has suggested some remedies such as boll-bearings, rubber tyres and wider or superimposed steel tyres. Adoption of design B for regional transport can provide one more solution since, in that case activities of the bullock cart can be confined only to regional tertiary roads and minor approach lanes. In some other countries like China, which are also faced with a similar problem, animal carts with steel tyres are not allowed to run along important highways.

All along the regional lines of transport, there should be telegraphic, telephonic and electric-power-lines forming a part of the regional grids.

It can be seen from the schematic diagram B, that nature of location of the new district and taluka reconstruction centres is such that the maximum range of their distance from any of the individual villages would not exceed by more than about 10 miles. This distance is insignificant and if we provide adequate facilities for locomotion as explained above, any of the villages can take full benefits of marketing, medical aid, education, entertainments and other cultural facilities provided at these new reconstruction centres. The size of population in individual villages vary over a wide range

and in most cases it is far below the optimum which may be considered necessary for incorporating any improvement in an effective manner. In fact, in many cases a village means nothing more than an isolated cluster of a few dozen huts. In view of this situation, it is obvious that each one of our innumerable villages can never be individually equipped with schools which can impart education of more than primary standards or with dispensaries which can give more than ordinary medical aid. And yet every tax-payer from any of the villages, big or small, has a legitimate right to have state facilities for higher education or expert medical aid, to the same extent to which the persons staying in cities can avail of. In view of this situation, the only solution to the problem lies in locating new reconstruction centres at easily accessible points along preplanned lines of transport and communication and equipping these centres with educational, medical and other facilities. Villagers will then be able to enjoy all that is best both in rural and urban life. Since their distance from the new urban centres would not exceed more than 10 miles, all villages will be like suburbs. It has been the experience in countries like U. S. A. that suburban conditions unite the best elements of both rural and urban life. They have found it impossible to maintain farm activities on economic basis without some sort of supplementary employment. In such cases suburban living is a great asset since it can cushion the agricultural unemployment. On the basis of some economic and sociological surveys in agricultural areas conducted by the U. S. D. A., they have come to the conclusion (which may as well be applicable to Indian conditions), that "suburban families have much larger income from non-farm part time employment than purely rural families. On the other hand rural families, had lower farm operating costs, but their sales were also lower and were short of covering the cost expenditure."* Therefore, through extension of good roads and automobile services concentration of employment in large cities is being progressively reduced and opportunities are being created for part-time work in remote rural areas. But inspite of all this, the main difficulty which they have experienced is that "as the distance between rural and urban centres increases, it becomes increasingly difficult to get supplementary income."* It is therefore obvious that the problem does not end with mere construction of roads and automobiles. We cannot ignore the distance factor. Moreover, social security based on mere facilities for mobilising labour can

* United States Department of Agriculture, Year Book 1936, 1937.

never be considered as adequate and desirable. Results of 50 regional reports on social reconstruction surveys undertaken by various universities in England, during 1941-43, at the request of the govt. under specific terms of reference, have revealed two important facts: (1) "no confidence can be felt that if economic activity is left to find its own level, rising demand for labour by more prosperous industries and areas will be large enough to use up the surplus from other industries and areas, even if there were no obstacles to complete occupational or geographical mobility," (2) "If industry is left to plan its own location, without general guidance, local excesses and deficiencies of suitable labour will appear and cause unemployment even if the general level of demand is high." It is one of the objects of the Beveridge Plan to prevent unemployment arising out of location of industry at wrong places. The results of these surveys will therefore, form the basis of the official policy on industrial location, which will be considered as a part of the larger problem of social security through full employment. It is expected that this would bring about fundamental changes in the existing pattern of British industry. All these considerations bring out the importance of location in bold relief. Judged on the basis of its economic implications, location of industry is perhaps more important than industrialisation itself. Also, location of educational, medical, cultural and other institutions is no less important from the point of view of their *effective availability* to those for whom they are meant. The whole problem of location is, therefore, considered in greater detail in the following pages, in its relation to the national transport and communication system.

VI

RURAL-URBAN CO-ORDINATION

The Design for regional transport proposed here, will have extremely beneficial effects on our agricultural economy by providing easily accessible markets in close proximity for consumption of farm commodities and all villages will be within the employment orbits of the new urban centres. This will increase the purchasing power of the villagers for consumers goods and thereby stimulate our new industrialisation. In contemplating any increase in national standard of living, we must necessarily presuppose such internal economic mobilisation among our own agricultural and industrial population. The fundamental basis of our future industrialisation must be altogether different from what it is in the case of countries like England, Germany or Japan. In the case of such countries their industrialisation anticipates foreign markets in the industrially less advanced countries of the world for the absorption of their products. Their industries, therefore, stand or fall with the availability or fluctuations in the foreign markets. Thereby, they subject the fate of their vast industrial populations to purely extraneous factors beyond their direct control. This brings in an element of perpetual uncertainty and insecurity. Perhaps, this very situation is the root cause of all the international unrest for some decades past. If we are to grow wise from this experience, our future industry must be made to rest on a well secured strong foundation of permanent nature. For absorption of their products, the industrial population should be made to depend on nothing beyond our own agricultural and the rest of the population; nor should our basic agricultural economy be made to depend on possibilities of foreign exports, even though we may have monopolies in case of certain goods. Vagaries of widely fluctuating demands in the case of jute has shown that such monopolies cannot be too much relied upon. If without any unfair methods we find foreign markets for both our agricultural and industrial products, it should only be looked upon as an additional asset. But possibilities of any such exports need not have any bearing on the stability of our own internal economy. As pointed out by Pandit Nehru "our country would not for all times depend on foreign exports for our primary

needs. We shall have to tap our national resources and depend on internal markets in the absence of which our industries would fade away."

One of the basic principles of Dr. Sun yat-sen's plan for China is that local supplies should be created to meet the local demands. He remarks,¹ "President Wilson has proposed a League of Nations to end military wars. I desire to propose to end the trade war by cooperative and mutual help in the development of China. This will root out probably the greatest cause of future wars." The ancient village economy of India was characterised by such internal economic adjustments which accounts for the stability of the village institutions during centuries of political upheavals. Even Karl Marx in the course of his writings has praised the self-reliant economy of the Indian village with its balance between agriculture and industry. Under the present circumstances, we cannot go back and again try to re-establish the self-sufficient village economy. But this principle can certainly be extended to a larger territorial unit of convenient size by evolving basic economic districts having internal balance between agriculture and industry producing consumers goods. The proposed reconstruction district schematically indicated in diagram B can thus be developed as a basic economic district with a balanced distribution of rural and urban areas and internal marketing organisation for the *essential* products of the local agriculture and industry.

During the worldwide crisis of economic depression, associated with the decline in international trade after 1930 even some of the industrially advanced countries had to adopt remedial measures, by way of internal adjustment, which were analogous in their effects to what has been suggested above. Thus in the case of U. S. A. under the Agricultural Adjustment Act of 1933, a special administrative machinery was devised which essentially aimed at reviving both agriculture and industry by stimulating internal exchange of commodities produced in rural and urban areas, within the country itself. It secured parity prices or fair exchange values for both agricultural and industrial goods and adjusted their production in tune with the effective demand. With rise in farm income due to parity prices, country demand for city goods increased and urban unemployment disappeared. Reciprocally, revival of urban trade benefited agriculture by stimulating the purchasing power of the consumers from cities. This mutual influence of rural and urban revival resulted in condition of

1 Sun Yat-sen (1921). The International development of China.

balanced abundance and laid a foundation of higher national standard of living. Economic rehabilitation of U. S. A. after the world-wide depression is really due to such internal exchange of commodities produced in farms and factories. It is true that some of the measures adopted for this purpose are relevant in the context of certain conditions peculiar to U. S. A. All the same, it represents a "profound readjustment and national response to an altered economic world."¹

An arrangement for internal marketing need not amount to a closed economic system or passive attitude and lack of enterprising spirit in international trade. In fact, with the present international contacts, such economic isolation is impossible, and even if possible, it would be a retrogressive tendency. It unnecessarily "limits the production of things a country is best fitted to produce or leads to accumulation of surpluses which under normal trade relations could be exchanged for some of the noncompetitive items and thus convert waste into useful form."¹ Idea of free trade is, therefore, really good if it is motivated by genuine desire for adjustment of mutual needs in the best interest of all the parties concerned. But unfortunately, this has been so far mostly used as a convenient tool for promoting the selfish national ends and the countries to abuse it most are those which were foremost among its exponents. With progressive reduction in the confidence in international credit, there is a growing tendency to receive compensating imports for the exports. But imports even if so received, cannot be effectively absorbed unless national wealth or the purchasing power is uniformly distributed throughout the country among both the rural and urban sections of the population. Therefore, even for the sake of effective participation in international trade it is imperative to have a sound and well balanced internal economy. In his annual report for the fiscal year 1936, to the president of U. S. A., the secretary for agriculture¹ (Mr. Henry Wallace) has brought out all these points in bold relief "Reciprocal international trade with each countrys exports approximately balancing the imports, leaves the problem of matching consumption with production essentially unchanged and emphasises the need for internal adjustments. Whether exporting will create purchasing power enough to absorb equivalent imports depends on who gets the purchasing power.....Restoration of international trade will not by itself eliminate the problem of surpluses. It requires the support of domestic policy that maintains a distribution of national income which will enable many potential

1. United States Department of Agriculture, year books 1936 and 1937.

buyers to be actual buyers." It is thus evident that distribution is as much important as production and mere increase in per capita income during our reconstruction may have no meaning for an average Indian in the absence of a proper machinery for distribution. For this purpose, adoption of regional transport according to design B can provide one of the many possible ways for creating a material basis or an organisation which will provide us with such a machinery for distribution. By its very nature, it will provide a permanent framework or an automatic medium for mobilisation and distribution of national wealth or purchasing power both in urban as well as rural sections of the population.

It will thus be seen that any organisation for internal marketing need not preclude the possibility of our participating in international free trade. On the contrary, considering its beneficial effects on the uniform distribution of purchasing power within the country as a whole, any such arrangement ought to stimulate our share in international trade rather than suppress it. In fact there is essentially no conflict between the two if reciprocal imports are received in the form of "non-competitive items" or such other commodities, which even if produced in the country, have "elastic demand" in the home market.

These suggestions are in conformity with the general policy of the National Planning Committee in determining the character of our future reconstruction. One of the guiding principles accepted by the N. P. C. is "to assure a degree of national self sufficiency, which, while not making our aggregate national economy a closed unit, would nevertheless be designed to provide utmost possible employment for all the resources of the country in men and material, known and unknown."

The above considerations should serve to emphasise the need for certain precautionary measures to secure the stability of our own internal economy. Basic structure of our national economy must be adjusted so as to assume the form somewhat analogous in its effects to a sort of internal barter between rural, urban and various other sections of the population. The term barter need not be taken as something indicative of primitive tendencies. If we define the minimum standard of living for an individual or family of average size by concrete specification of essential commodities such as articles of diet, clothing and other items produced in farms and factories, with parity in their exchange values, the whole transaction obviously reduces to a barter. Money, under such arrange-

ments only serves as a convenient tool for effecting the interchange of equivalent services. However, such an organisation cannot be established with the present disparity in our rural and urban or agricultural and industrial population, which must be adjusted to about an equal proportion. Existing cities in India only accommodate about 10% of the population and the rest 90% staying in villages bring undue pressure on our agricultural potentialities. It is, therefore, imperative to create conditions whereby a part of this overwhelming rural population may like to stay in some adjacent urban centres and remain engaged in industrial or some form of nonagricultural pursuit. This can be done either by (1) increasing the population of our existing old cities by locating our new industries at these places or (2) by designing our new transport system in such a manner that if our new industries are located at suitable points along its course, it will create a uniform and well balanced distribution of rural and urban areas all over the country and thus provide a permanent framework for internal marketing as explained above. For a number of reasons discussed in detail earlier, the former would not be a rational procedure. Sir William Beveridge, author of the social security plan for Britain remarks, "Indian industry would probably expand but it is important that it should be properly distributed to avoid the growth of dreadful sprawling towns that we have in this country and U. S. A. On the basis of the recommendations of the Barlow Commission, Sir Peter Abercrombie has proposed a plan for the greater London which requires complete ban on the location of new industries; systematic dispersal of old industries, reduction in population and creation of agricultural green belts all around. The same trends are evident in U. S. A., Europe and Russia. Therefore, the idea of increasing the population of our few scattered urban centres would be definitely retrogressive and suicidal from the socio-economic aspects.

The first alternative would lead to mushroom like growth of the old towns and add to their ugliness beyond all proportions. It will also accentuate the existing rural-urban relations and add to the existing regional disparities as regards relative industrial growth in different provinces. In view of all these considerations, in so far as the term "urban" implies the location of industrial activity, the solution of our problem essentially consists in *creating* new urban centres so as to bear certain proportion with the adjacent rural areas. This is exactly what we may be able to achieve by constructing the regional transport system according to design B

and locating the new industries at suitable points along it. The points where two or more lines of transport and communication meet together would provide most suitable sites for locating our new industrial activity or an urban centre. On the basis of this criterion, adoption of the design for federal and regional transport proposed here, will enable to create at least four different classes of new urban centres as listed below:—

(1) Centres located at the cross-points and terminus-points of the federal lines of transport and communication. These may be called "Federal Reconstruction Centres" or "Federal Cities" for the sake of convenience in expression.

(2) Centres located at the points where regional primary lines would meet the federal lines of transport. These may be designated as "reconstruction district centres" in provinces or "R. districts" to differentiate them from ordinary revenue district towns.

(3) Centres located at the points where regional primary and regional secondary lines of transport cross each other. These may similarly be called "reconstruction taluka centres" or "R. Taluka centres" to differentiate them from the old revenue taluka towns.

(4) Centres located at the points where regional secondary and regional tertiary lines of transport cross each other. These may be called as "reconstruction sub-taluka centres" or "R. sub-talukas" in the same manner.

Mutual relations of any of our villages with these four different classes of new urban centres can be so adjusted that each of them will assume a definite function in the process of coordination of agricultural, industrial, educational, medical and various other spheres of activities under the new reconstruction programme. The tentative nature of such a rural-urban coordination has been categorically indicated in the following table V by taking some concrete cases by way of illustrations:—

TABLE V
RURAL-URBAN COORDINATION

TABLE V

RURAL-URBAN COORDINATION

<i>Sphere of activity</i>	System of location and distribution of functions in executing the all India reconstruction programme.			
	<i>Village</i>	<i>R. sub-taluka centre</i>	<i>R. taluka centre</i>	<i>R. district centre</i> <i>Federal reconstruction centre</i>
(1) Agriculture	Consumption of agricultural products for feeding the urban population and as raw material for urban industries			
Production of agricultural commodities such as: cereals, pulses, oil-seeds, fibres, roots, tubers, fruits, vegetables, spices, condiments, stimulants, drugs, sericultural, apicultural, dairy, sheep, poultry and other products.	Model farm providing facilities for: (1) demonstrating improved agricultural methods, (2) third stage multiplication of improved strains of crops and livestock (3) nurseries for large scale production of seedlings of trees yielding fuel, fruits, flowers, timber	Agricultural research substation for selection, trial and second stage multiplication of improved strains of crops and livestock. Agricultural high-school and Veterinary centre. Distribution of implements, tools, fertilisers, insecticides.	Regional Agri. research station for improvement of all the types of local crops and livestock and their first stage multiplication. Agri. advanced school for training agri. assistants and private farm managers. District agri museum	Federal Agri. Research Institute and Agri. College. Location of Basic industries relating to agriculture such as production of implements, tools, machines, synthetic fertilisers, insecticides, fungicides, etc. Federal agri. Museum for (1) exhibiting the

	and other economic products (4) supply of improved strains of grasses and legumes for reseeded village pastures (5) supply of studbulls, rams, goats, poultry, bee hives, silk-insects etc. (6) Veterinary centre (7) Agricultural training school. Co-operative centre for: (1) sale of improved seed implements, tools, fertilisers, insecticides, fungicides etc. (2) scientific storage and marketing of agricultural products. (3) Credit and banking facilities.	des etc. to R. Sub-taluka centres. Co-ordination and control of agri. Co-operatives located at R. sub-taluka centres.	for (1) exhibiting local agri. products (2) registering and estimating demand for them so as to roughly control the volume of their production. (3) Control of intra-regional marketing of agri. products (4) Collection and maintenance of local agri. statistics.	products of the above basic industries and other agri. products of the adjacent regional units. (2) registering and estimating their effective demand so as to control the volume of production. (3) control of inter-regional marketing of agri. products. (4) Agri. statistics for adjacent regional units. Meteorological centre for regional weather forecasting
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TABLE V (Continued)

System of location and distribution of functions in executing the all India reconstruction programme.

Sphere of activity	Village	R. sub-taluka centre	R. taluka centre	R. district centre	Federal reconstruction centre
(2) Industry	Consumption of the products of urban industries. Minor cottage industries managed under well organised decentralisation so as to provide part-time work to farmers.	Industries based on preliminary processing of village agri. products such as : milling of cereals; dal making of pulses; crushing of oil-seeds and sugar-cane; ginning of fibres; curing of tobacco; dehydration, drying and sulphuring of fruits; reel-ing and carding of silk cocoons and wool; collection of honey, milk, cheese, butter, ghee and other dairy and poultry products from adjacent vil-lages; preparation of	Industries based on advanced processing of agri. products such as: baking, confection-ary, flakes, pop corns, malts, diastases, dex-trines starches, bever-ages etc. from cereal products; refining, hydrogenation or hardening of oilseed products; prepara-tion of slivers, spinn-ing, bleaching and dyeing of fibres; re-finishing of raw sugar and honey; canning, preparation of pectins jams, jellies, pickles	Location of indus-tries producing other consumer goods such as cotton, woolen & silk textiles; toilets, perfumes, pharma-ceuticals, drugs, furni-ture, ceramics, glass-ware, metalware, domestic utensils, footwear, leather goods, electric arti-cles, stationary etc. Industrial museum for (1) exhibiting the products of local industries (2) register-ing and estimating their demand so as to roughly adjust their	Location of Basic industries such as heavy machinery, tools, auto-mobiles, locomotives, aircrafts, heavy chemi-cals, pharmaceuticals, dyestuffs, ceramics, opticles, scientific instruments & appara-tus etc. Federal industrial museum for (1) exhibit-ing the products of the basic and other regional industries, (2) register-ing and estimating the demand so as to adjust the volume of their production, (3) inter-regional marketing of

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	<p>blood and bone meals; tanning of raw hides into leather; distillation of fuel-wood and recovery of its primary by-products.</p> <p>Sale of products of urban industries to villagers.</p> <p>Producers and consumers co-operatives.</p> <p>Coordination of small-scale cottage industrial units scattered in adjacent villages and their marketing.</p>	<p>and other forms of fruit and vegetable preserves; preparation of sweets and confectionary from dairy and poultry products, dyeing and processing of leather.</p> <p>Technical training schools for carpentry, smithy and other basic guilds.</p>	<p>volume of production (3) controlling the intra-regional marketing of industrial products.</p> <p>Coordination of agricultural and industrial marketing.</p> <p>Commerce school and advanced technical high schools for occupational training.</p>	<p>industrial products (4) collection and maintenance of industrial and commercial statistics.</p> <p>Commerce, law and other colleges.</p> <p>Federal technical research institute.</p>
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TABLE V (Continued)

Sphere of activity	System of location and distribution of functions in executing the all India reconstruction programme.				
	Village	R. sub-taluka centre	R. taluka centre	R. district centre	Federal reconstruction centre
(3) Defence	Compulsory training in physical culture, mass discipline, use of arms etc. to all the villagers within certain age groups.	Military preparatory training school.	Military high-school.	Military training centre for lower grade officers in army and air-force. Small industrial units for production of minor armaments, ammunitions, uniforms and other military equipment.	Military college attached to all India Military Academy, providing facilities for training in all the higher official ranks in army, navy and airforce. Location of basic industries producing heavy armaments, ammunition and other equipment for defence.

(4) Public Health	<p>Preliminary medical aid in cases demanding immediate treatment by providing first aid box, medicinal chest etc. in every village.</p> <p>Training of first aid volunteer units in each village equipped with a special speedy vehicle to convey the patients to nearest R. taluka medical centre.</p>	<p>Medical centre with sufficient provision for indoor patients and maternity cases from adjacent villages.</p> <p>Special staff of visiting doctors, nurses and sanitary inspectors attending to urgent or periodic calls from the villages and organising both preventive and curative measures.</p>	<p>Well equipped hospital for routine medical aid and minor surgical operations.</p>	<p>Hospital equipped for advanced medical aid and routine surgical operations.</p> <p>District segregation centre for infectious diseases well isolated.</p> <p>District Eugenic Society collecting & recording data of family histories, incidence of hereditary diseases and advice on eugenic problems.</p> <p>Medical schools for preliminary medical studies and for training nurses, midwives, compounders, medical and surgical assistants, sanitary inspectors etc.</p>	<p>Hospital fully equipped for advanced medical aid and major surgical operations.</p> <p>Medical college and Federal Medical Research Institute for conducting extensive & intensive research in various branches of medical science.</p> <p>Federal laboratories for manufacturing vaccines, serums etc. and for standardisation and certification of various biological products.</p>
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TABLE V (Continued)

Sphere of activity	System of location and distribution of functions in executing the all India reconstruction programme.				
	Village	R. sub-taluka centre	R. taluka centre	R. district centre	Federal reconstruction centre
(5) Education	Nursery, primary & secondary schools. Regional IV-grade library.	Nursery, primary, secondary and high-schools. Regional III grade library.	Nursery, primary, secondary, and high-schools and intermediate schools in arts and sciences. Regional II grade library.	Nursery, primary, secondary, and high-schools, intermediate schools and colleges in arts and sciences upto first graduation courses only without any facilities for post-graduate studies. Regional I-grade library and small educational museum.	Schools, colleges and a Federal Institute for post-graduate studies and research in all branches of Arts and Sciences. All higher post-graduate degrees to be conferred by The Federal Board of Universities so that such degrees need not have any regional or provincial attributes.
	<p>Federal library fully equipped with international literature and references.</p> <p>Federal arts, educational, natural science and other museums imparting knowledge by visual methods; Botanical and zoological gardens displaying the flora and fauna of the adjacent regional units.</p> <p>These new federal urban centres should facilitate and promote interprovincial contacts so as to emphasise the existing common cultural make-up and evolve it further into an all-India cultural pattern.</p>				

It will be seen from the above table that the design for transport system proposed here can serve as the most efficient medium for implementing our existing all India plans for agriculture, industry, defence, public health and education. The location of the reconstruction activities in the manner indicated in the above table will enable us to have the maximum and most effective spread of medical and educational facilities within the minimum number of medical and educational centres. Perusal of Table V will also indicate how the present design for federal and regional transport can serve as an instrument in executing the various spheres of reconstruction activities in a systematic manner with clarity, precision and efficiency while organising the vast mobilisation of men and material. It is needless to point out here that it will not be possible to achieve all this to the same degree if we are to have our regional transport according to design A which unnecessarily attaches undue importance to our old district and taluka towns as the primary reference points. Several vested interests will make it impossible to reshape these old ugly cities according to modern town planning ideals and considerable energy shall have to be wasted in dealing with problems like acquisition and valuation of lands, slum clearance, reconditioning of old drainage, widening of old crooked lanes and so on. Perhaps, in that case, this is all what our new reconstruction may mean. If we must plan the regional transport lines with old district and taluka towns as the main reference points, for several decades to come, we shall have to bear the sight of narrow lanes devoid of drainage; dark suffocating houses with their walls shared by rodents and reptiles; innumerable variety of diseases and regularly recurring toll of epidemics, while many other countries would think in terms of clean well designed cities with spacious roads lined with avenues, public parks, playgrounds, stadiums, beautiful houses and all that modern science can make us think and materialise in concrete forms. It is many times better to start anew rather than recondition an ancient enterprise. If administrative and other functions of the new reconstruction are located at the old district and taluka towns, it is possible that our future planning may not be taken more seriously than the isolated patchwork and piecemeal efforts tried under the foreign rule. Habits or mental attitudes of individuals or groups are closely linked with the places due to long association. If the new reconstruction centres are located at new suitable places as suggested here, it will have considerable psychological effect since it will enable us to get out of the old rut accumulated through ages. Such procedure will help us not only to remove the economic paralysis as shown above but also enable us to overcome the mental stagnation and administrative inertia.

It has been pointed out earlier that adoption of design B will bring every village within two miles from a well coordinated system of all India transport and provide a nucleus for future development of urban centres within a distance not exceeding 10 miles from any of the villages wherever placed. In the process of gradual urbanisation of overwhelmingly rural population, many of the villagers may *voluntarily* like to stay in these closely adjacent new urban centres. Such voluntary shift over a negligible distance not exceeding ten miles will in no way hurt the sentimental attachment of individuals to a particular place. In contrast to persons accustomed to stay in cities and towns, the villagers have inherent sentimental affection for their own surrounding landscape and it is desirable to conserve this mental attitude instead of disregarding it. In fact the whole procedure suggested here amounts to carrying the best and most useful elements of city life near to the villages instead of shifting villagers to cities.

The creation of new urban centres as outlined before does not mean sudden transference of village population to these new places. This is neither intended nor possible. On the contrary there should be some restrictions on individuals intending to settle at the adjacent new urban centres. Far from being a process of compulsion, it should be a matter of privilege to be able to settle at these places which should be decided on the basis of certain standards relating to character, eugenic, hygienic and other qualities of body and mind. In some of the principal cities in China, oath taking and registration is necessary before one can acquire the rights of citizenship and identification cards are issued for the elimination of undesirable antisocial elements. It would not be out of way to have some such procedure in case of our new urban centres. Only such persons should be permitted who have undergone atleast a short term training course for a few months and acquired the irreducible minimum of education and civic sense. They must be conscious of their elementary rights, duties and liabilities as citizens; must know how to use their own discretion in using the right of franchise; must respect laws or resent its excesses in a decent and disciplined manner. They must know atleast such simple things as where to throw dust and domestic waste and discard certain habits so as to be in tune with the basic principles of personal or public sanitation. These rules cannot be effectively enforced in the environment of the old towns due to long association of habits with the places. But the same rules can be enforced in the case of new urban centres and the whole mental outlook can be made to undergo considerable

change. In fact most of the rules of municipal sanitation already exist in all our old towns and yet we see people disfiguring the public places and doing all sorts of things which they are not supposed to do. The rules are therefore more conspicuous by their breaches. Officials who are supposed to enforce them also ignore them because even they feel there is nothing unusual in it to demand any special attention. This would provide an instance of the mental stagnation and administrative inertia referred to earlier. The need for some precautionary measures as stated above may therefore be understood. In the absence of any such measures, creating new urban centres can only mean piling the new slums on top of the old existing ones or carrying the virus of city life much nearer to the villages and allowing them to be affected by it.

It will thus be evident that creation of new urban centres does not imply any sudden cataclysmic changes of the type which disturb the social equilibrium. In any process of comprehensive social change from one phase to another, it is very much important to have the transition as smooth as possible. Otherwise disadvantages resulting from such drastic sudden change may far outweigh the gains in view. This fact has not been ignored in making all these suggestions. In fact, as has been repeatedly stressed earlier, creating new urban centres means nothing more than merely locating sites for the present, each of which will serve as a nucleus for future development of urban centres by a process of gradual growth. Thus we may take a concrete instance of one of the new urban centres which has been designated earlier as the "reconstruction sub-taluka centre". All that is necessary to *initiate* urban activity at this centre is to locate new industries based on primary processing of agricultural products as specified in table V, depots for sale of fertilisers, insecticides, fungicides, agricultural implements, tools, shops for selling to villagers the products of urban industry, organisation for coordinating the decentralised production scattered in rural cottages, producers and consumers cooperatives, a high school, technical school, dispensary, theatre, library, stadium, park and postal communication centre for the villages in the neighbourhood. The same applies to R. taluka and R. district or the Federal reconstruction centres, with their respective functions specified in table V. Simple location of the various activities enumerated in table V, to begin with, will be more than enough to initiate the development of a new city or a town by a *Gradual process of organic growth* in due course of time and according to a systematic and preconceived plan. The actual rate of development can be adjusted

to any proportion at which we can take it. The size of population in the case of each of these four classes of new urban centres can be fixed in relation to the socio-economic functions which they are intended to serve.

The idea of creating new urban centres is by no means new and need not be taken as something unpractical or academic in nature. Dr. Sun Yat-Sen in his plan for Chinese reconstruction has proposed the creation of new cities and towns at all the important transport centres where new industry can be located. In England, under the new industrial boom, when inflated cities were swelling enormously and rural culture was in danger of extinction, Ebenezer Howard elaborated the idea of garden cities. He visualised self-contained balanced communities of rural and urban population with constellations of central and satellite towns limited in size and population. These ideas soon gave birth to garden cities like Letchworth and Welwyn where well designed factories work in the midst of parks and avenues. They have been described as islands of human communities in the midst of profuse greenery. Some of the best elements of Howards ideas have left permanent mark on English architecture and especially after the bitter experience of the last two wars, it has created a special appeal for itself. It is interesting to note that The New Towns Committee (1946)¹ in Great Britain under the chairmanship of Lord Reith have strongly urged for the prevention of Suburban Sprawl and have recommended the establishment of towns on entirely *new* sites in the *low* population density areas of England, Wales and Scotland. Some of the well known French architects like M. Andre Lurcat and Le Corbusier² have proposed plans for regeneration of France which are based on the main theme of decentralisation through linear town planning. They have proposed new cities and towns of limited size at convenient intervals along roads, railways and canals and equipping them with clubs, cooperatives and other amenities. This is intended to prevent the tentacular growth of cities through excessive rural depopulation. The recent five year plan of Russia is very much opposed to excessive growth of cities and has provided for rational distribution of population through systematic location of new industries and redistribution of old ones. For this purpose, it has prescribed definite limits for the size of population in existing

1 Social structure in new towns : Report of the New Towns Committee H. M. stationary office, London (1946).

2 Le Corbusier (1946) Propos D'Urbanisme.

cities. Thus for instance, in the case of Rostov at the gates of the Caucasus, the population must not exceed 650,000 in future. During successive five year plans in Russia, new towns have sprung up by scores where only villages or barren grasslands had previously been.¹ Over 90 new cities owe their origin to the first five year plan alone.² Such are the cities like Magnitogorsk in Urals, Keergandha in Khirghiz and the port of Murmansk.

In directing the new industrial growth in our country we cannot afford to ignore these recent trends. Unfortunately, whenever any new industrial concern is floated, we are still not in a position to overcome the temptation of piling it on one of our old cities. The sooner we try to dissociate these cities with the new industrial growth, the better. Mere industrialisation has no meaning unless we approach the problem with a wider perspective.

BALANCED REGIONAL DEVELOPMENT

There is gross disparity in the relative industrial growth as amongst different parts of India. This can be indirectly inferred from the percentage of urban population in different parts of India which varies over a wide range from less than 4% in Assam to over 25% in Bombay province. Bombay and Calcutta alone account for more than 50% of the total factory workers. Such conglomeration of industry in isolated clusters leads to corresponding disparities as regards land values, production, distribution, employment, wages, prices and living standards. It also leads to accumulation of slums, inadequate housing and traffic congestion. Recent wars have shown that industrial concentration is the weakest link in national defence and many countries have painfully realised that there is no wisdom in keeping all the eggs in the same basket. Also, the countries like U. S. A. are now realising that industrial concentration and higher rate of production through progressively specialised machinery is not desirable beyond a point when it leads to widespread unemployment. "It is true that decentralisation of industry by itself is not a source of new employment ... But spreading work geographically may spread it in economic sense too, by diffusing its benefits over wider areas³. The Third Five Years Plan in Russia requires a decisive rejection of Jigantomania in favour of medium or small scale enterprises evenly distributed over the basic

1 Morris Dobb (1945) U. S. S. R. Her Life and Her People, Univ. of London Press.

2 Molotov V. (1944) The Third Five Year Plan, Samabaya Press, Calcutta.

3. U. S. D. A. Year Book of Agriculture, 1936,

economic districts.¹ All modern ideas of industrial location therefore go against the principle of conglomeration. The Barlow Commission in 1937 and the Scott and Utwath committee in 1941 specially appointed in England have recommended Govt. control on location of industry. In order to secure well distributed growth of new industry in India, both federal and regional govts. must evolve a special organisation for licensing and controlling the location of every industrial unit, big or small. Location of large scale basic industry should be controlled by the federal govt. and location of small scale cottage industries or miscellaneous trades and crafts producing consumers goods, should be controlled by the regional units according to a common agreed plan.

Apart from such a control on the location of new industries some steps must be taken to remove the existing industries from congested cities like Bombay, Calcutta, Madras, Ahmedabad, Canpur etc. and diffuse them evenly over the new R districts.

Many of the mobile and linked industries can be systematically decentralised and located in any manner as we want. But certain other group of industries do not afford such a degree of freedom in their location. Thus rooted or immobile and extractive industries like mining have to be located near the mineral deposits only. The same applies to industries working on weight losing or perishable raw materials. In such cases however, after the primary product is once isolated, subsequent processing and other linked industries can be located in any desired manner. At Jamshedpur and other mining centres in India many of the accessory and chain industries are unnecessarily allowed to grow in clusters. All that is necessary to locate at these places is the production of crude or refined iron. Other industries like processing of high grade steel, production of ferro-alloys, tools, implements, automobiles or machines can be dispersed and located at several suitable centres. Thus in the case of England and U. S. A., steel and allied industries have prospered at Sheffield and Pennsylvania respectively, both of which are away from the mining centres. It will thus be seen that through proper discretion and adjustment, we can have considerable freedom as regards the location of even the basic industries.

Even though need for dispersal of industries in cottages has to be emphasised for obvious reasons, many of the industries do not permit of being so organised. Thus for instance, we cannot manufacture sulphuric acid on cottage scale and even if it were

1. Molotov v. (1944) The Third Five Year Plan.

possible, it would not at all be desirable to do so. The same applies to many other abnoxious and dangerous class of industries which would spoil the peace, hygiene and serenity of the domestic environment. In our anxiety to decentralise industry into cottage units we must not convert home into factory. We shall have to see where its utility ends and nuisance begins. It is, therefore, obvious that these and some other basic industries shall have to be organised on the basis of large factory units. As explained by Pandit Nehru, "even though due emphasis on cottage industries is necessary, there are other factors which make it impossible for a country to depend on cottage industries alone. No modern nation can exist without certain essential articles which can only be produced by big industries. Not to produce these is to rely on imports from abroad and thus to be subservient to the economy of foreign countries. Therefore, it seems essential to have both big industries and cottage industries in India and to plan them in such a way, as to avoid conflict. Heavy and basic industries are the foundations of a nations economic strength on which other industries can be gradually developed."

The nature of location of small scale cottage industries on the one hand and large scale basic industries on the other, which has been tentatively proposed in table V will show that the relationship between the two is essentially complementary and as such they need not come into conflict. Both have their own place in the synthetic coordinated picture. All industries which permit of being decentralised into cottage units can be located in villages and new R. district and R. taluka centres as shown in the table V. Basic and large scale industries working in large factory units can be placed at the federal reconstruction centres located at all the cross points and terminus points of the federal lines of transport.

Essential prerequisites for decentralising industry into cottage units are : (1) An efficient system of transport and communication, (2) Cheap and widespread distribution of electric power, (3) prefabrication, (4) splitting of individual industries in their component unit processes, (5) standardisation and specification of individual items, (6) Systematic location of linked processes, during various stages, (7) Central organisation for the coordination of related processes in the link and (8) cooperatives for producing and marketing. Most of these requirements are kept in view in proposing the design B for regional transport and in locating the various spheres of activities as indicated in the table V. Such

location will enable us to control and coordinate the various decentralised units in a systematic and clearcut manner. If local concentration of industry is bad, its haphazard decentralisation is even more dangerous. Decentralised units must be mutually correlated with the precision of clockwork. Otherwise the remedy would be worse than the disease.

The System of location indicated in table V will also provide a very suitable framework for the operation of intensive cooperative activities along the lines of the Chinese "Indusco" movement. They are easy to start with small initial outlay and when once started proceed under their own acceleration; ratio of capital to production is high, prevent accumulation of capital with individuals and disperse it freely without stagnation. They also check profiteering, keep commodity prices down and result in continuous rise in living standards.

It will be seen that if the various activities under the new reconstruction are located in the manner as indicated in table V, it will create a condition of balanced regional developments as regards the rural and urban areas, agriculture and industry, large scale basic and small scale cottage industries, educational, medical and such other facilities uniformly spread all over the country without localisation. In any comprehensive programme for national regeneration, it is very much necessary to have a good working balance between all these various facets of national economy. However, "when we go from general to particular and try to specify the form and character of a good working balance, we enter difficult grounds." System of location indicated in table V is, therefore, only an attempt to put the abstract notions of such "balance" into concrete form and to show how the adoption of regional transport according to design B may serve as an instrument for achieving these ends.

In order that an abstract idea may be made to assume concrete forms we always need some material basis as a medium for expression. The concept of economic balance can be made operative through the medium of an appropriate method of location in relation to a properly designed system of transport and communication outlined above. As remarked by Lenin,¹ "We must reestablish the balance of agriculture and industry and in order to achieve this we must have a material basis. What is the material basis of industry and agriculture? It is rail and water transport."

¹ Tverskoi K. N. (1935) The Unified Transport System of the U. S. S. R. Victor Gollancz, Ltd., London.

VII

POLITICAL UNITS OF THE FEDERATION

The design for the federal transport proposed here does not take into account the recent political partition of India. Geographic and economic realities do not permit such recognition. In spite of similar man-made boundaries in the past imposed by transitory political sentiments, India has always existed as an economic unit within the territorial limits of its well defined boundaries decided by the nature. The two Governments shall have to set aside their differences and face realities by devising some common organisation for unified economic planning and for certain other subjects which in the very nature of things have to be done in common. Execution of the common plan may be done separately by the two Governments in their respective territories. However, if sentiments outweigh realities and render any such coordinated action impossible, it will only mean that the two corners of India have taken the risk of lagging behind and it will be very difficult for them to cover the lost ground and come in line with the rest of the country. In such an event, the design proposed here will still be applicable to the vast majority of areas under the Indian union without any material change.

The design for regional transport does not take into account the territorial boundaries of the provinces. It is necessary to stress here the need for an agreement between the federal power and the provinces that even though their provincial boundaries may continue to remain in any form which they themselves may mutually decide, these boundaries need not prevent the establishment of both federal and regional lines according to any plan commonly agreed to as the best in the interest of the country as a whole. The main purpose of this design is the economic co-ordination and the arbitrary boundaries of the existing or reorganised linguistic provinces do not carry much significance for this purpose. Since any of the provinces cannot exist in economic or cultural isolation from the rest of India, it is in their own interest to participate in such a common enterprise.

In U. S. S. R. during the first five year plan, both planning and execution was under the direct control of the central Government.

But in view of the vast territories and consequent delays in execution, they introduced certain changes since 1934 according to which planning alone was done by the central authority and the execution by the respective units. These changes however, did not affect certain important subjects like transport and communications which continued to be retained under central control both for planning and execution. We may have to follow similar procedure since unified action through common centre is essential to avoid discordant policies being pursued by various units in isolated compartments. It is therefore, necessary to enlarge the scope of the Federal Authority and give it a greater measure of control in planning and directing the all India reconstruction programme.

REGIONAL PLANNING

In view of the vast continental size of India, all economic planning shall have to be on the regional basis. In the case of such regional planning, adjacent areas having common climatic, topographical, ecological, geographical and other features are grouped together and developed as integral territorial units without any reference to the political boundaries of the states concerned. The existence of such boundaries, though recognised for all practical purposes is not allowed to hinder the co-operative enterprise among the provinces. Thus each of the new river projects shall have to be developed as a unit affecting the entire river system including tributaries, irrespective of the boundaries of the provinces concerned.

Reference has been previously made on page 40 to the division of India into four sectors formed by the two primary lines of federal transport. It has been shown how each of these four regional sectors is homogeneous in respect of topography, hydrography, climate, population, agriculture, industry and other natural factors. These four regional sectors do not include the vast areas under the Himalayas. This long chain of mountains all along the land frontiers must be divided into suitable regions. The main Himalayas have roughly east-west bearing but at two extreme points it abruptly turns southwards with a sharp angle somewhere around the Hindu-kush in north-west and around the north-east border of Asam near Sadiya (Diagram D). These two abrupt turning points in the Himalayan chain are called the Syntaxial Angles or the Geosynclines and have been attributed by the geologists to the resistance offered by

the underlying strong foundation of ancient rocks at these two places, to the horizontal folding movements in the earth's crust as a result of which these two points serve as pivots around which the mountains move. The Himalayan chain can be split into three regions at these two geosynclines as follows (Diagram D) :—

(1) *The Western Himalayan region*, from Karachi to Chitral and Hindukush range; the federal line of transport between Karachi → Peshawar → Chitral shown in the map should demarcate the eastern boundary of this region and should be orientated along the transition between the highlands and the plains of Sind, Punjab and North-West frontier areas.

(2) *The Central Himalayan region*, from Hindukush, Karakoram range, Swat, Gilgit, Ladakh, Kashmir and Jammu eastwards upto Bhutan and Sadiya on the northern border of Asam where the river Brahmaputra turns south. Federal line of transport between Peshawar → Delhi → Patna → Gauhati → Sadiya as shown in the map should serve to demarcate the southern boundary of this region and this crescent shaped line of federal transport should be orientated just along the transition where the northern highlands merge into the southern alluvial plains.

(3) *Eastern Himalayan regions*, from Sadiya southwards along the Naga Hills, Imphal, Chittagong Hills and Arakan Hills upto the port of Akyab. The federal line of transport between Sadiya → Kohima → Silchar → Comilla → Chittagong as shown in the map should be orientated just along the transition between these hills and the western plains so as to demarcate the western boundary line of this region.

In the case of each of these three Himalayan regions, there is considerable internal homogeneity regarding geological, climatic, agricultural and other conditions or linguistic, cultural and racial composition of the local population. Thus the western Himalayas are characterised by dry, arid, low rainfall areas with scanty vegetation and the racial composition is dominated by Pathan element speaking Pashtu, Baluchi and other dialects belonging to the Indo-Iranian family. The central Himalayas are characterised by medium to heavy rainfall, elevations frequently above the snow line, dense vegetation and Indo-Aryan racial composition along the lower elevations merging into progressively Mongolian elements as we go north towards higher elevations. Eastern Himalayas are characterised by heavy rainfall and dense perennial vegetation with

racial and linguistic composition predominantly Mongolian as we go northwards and eastwards.

These three Himalayan regions together with the four regions formed by the two primary lines of federal transport as discussed before on page 40 would divide the whole of India into seven regional zones each internally homogeneous and different from the rest in various ways. Each of these seven regions may be treated as a unit in planning the all India reconstruction.

Our islands (1) in the Pacific like Andaman and Nicobar and those (2) in the Indian Ocean like Laccadiv and Maldiv may be grouped into two separate extra territorial regions for the purpose of their development (Diagram D).

OPERATIONAL UNITS FOR THE EXECUTION OF RECONSTRUCTION PROGRAMME

Even after the division of India into seven regions as above each of these regions, though convenient for the purpose of unified planning, would still be too large for the purpose of executing the regional plans. For the sake of practical convenience in executing the reconstruction programme, it will be necessary to split each of these seven vast areas into smaller units of suitable size having permanent clearcut demarcations. Various secondary lines of federal transport can serve the purpose of demarcating such areas. It will be seen from the map that the secondary lines of transport divide the country into large number of roughly square or triangular blocks. Each of these territorial blocks demarcated by the federal secondary lines of transport can be treated as an operational unit for executing the federal subjects in the all India reconstruction programme such as botanical, zoological, geological, geophysical, topographic, hydrographic and other long-term surveys as also the federal activities in the field of agriculture, industry, education, defence etc.

In a similar manner, each of the new Reconstruction Districts demarcated by the regional lines of transport as shown in the schematic diagram B and C, can be each treated as an operational unit for executing the provincial subjects in the all India reconstruction programme such as reclassification of land for agriculture, forestry and other utilisation, collection of data on population, age groups, effective man-power, health, literary, raw materials, industrial possibilities and other provincial subjects relating to agriculture, industry, education etc.

AREAS UNDER TEMPORARY FEDERAL CONTROL

Some of the areas in the different parts of India may require federal control due to (1) position along land frontier, (2) lack of sufficient population, (3) nomadic or tribal character of their social organisation, (4) lack of any political consciousness to assume their own responsibilities, (5) lack of any means to develop the local resources, etc. Such areas can include Chittagong, Manipur and Naga hills upto the Burmese frontier, north-east border of Assam upto Chinese and Tibetan frontiers, all the Himalayan range from Saikhoa ghat upto Hindukush, Khyber and Bolan Passes (excepting the well organised states and provinces like Nepal, Himachal, Kashmir or N. W. F. province), low lands of Cutch (Ran), deserts of Sind and Rajputana and such other parts. All these areas can afford ample scope for forest, mineral hydroelectric and other activities and thereby improve the conditions of the local people in various ways. Federal control over deserts is necessary in view of their rapid spread outwards and encroachment on all the surrounding provinces. It has been estimated that a century would be "optimistically too long a period" before which considerable parts of Sind, Punjab, Rajputana, Central India and Gujarat must form a part of this extensive desert if nothing is done to prevent its spread. For this purpose it is necessary to establish a federal research station along the lines of desert research laboratories in Arizona, Atacama and Syria. The Chilean Govt. has undertaken a plan at an estimated cost of 25 million pesos to check the spread of Atacama desert which is moving southwards towards centrally populated area at the rate of about one kilometre per year. Defensive measures consist of creating a forest barrier out of the indigenous flora which is expected to "bring rains and improve climate." This should make us realise how other countries are seriously attending to these problems.

Before we can undertake any improvements in all such areas under federal control, some rudiments of transport and communication facilities to the necessary extent shall have to be provided first.

VIII

ESTIMATES OF LINEAR MILEAGE

The federal system of transport proposed here and as shown in the map will require the following linear mileage approximately:-

TABLE VI

Federal System

	<i>Roads</i>	<i>Railways</i>
Federal Primary Lines	3,000 miles	3,000 miles
„ Secondary „	17,000 „	17,000 „
„ Tertiary „	7,000 „	7,000 „
	<hr/>	<hr/>
	27,000 „	27,000 „
	+ 3,000* „	+ 3,000* „
	<hr/>	<hr/>
Total	30,000 miles	30,000 miles

(*Plus approximately 10% addition to provide for linear deviations from straight course due to topographic barriers and other unforeseen factors)

The above estimate has been arrived at by using linear scale on one of the standard maps of India issued under the certificate of the Surveyer General.

As regards the regional transport system, it will be evident from the schematic design B that each " Reconstruction District " with an area of about $100 \times 30 = 3,000$ sq. miles would require the following linear mileage of transport and communication lines:—

	<i>Roads</i>	<i>Railways</i>
Regional Primary Lines	100 miles	100 miles
„ Secondary „	150 „	- -
„ Tertiary „	400 „	- -
	<hr/>	<hr/>
	650 „	100 „
	+ 50* „	- -
	<hr/>	<hr/>
Total	700 miles	100 miles

(* Plus roughly 10% addition for reasons as explained above)

Therefore, each reconstruction district with an area of 3,000 sq. miles will require about 700 miles of Roads and 100 miles of Railways, on the basis of the design for regional transport proposed here. At this rate we can roughly estimate the maximum and minimum linear mileage of regional transport lines for the whole of India.

Maximum requirements:—The total land surface of India is about 1.8 million square miles. At the rate of 700 miles of roads and 100 miles of Railways for every 3000 sq. miles of area, total requirements for the whole of India would come to about $(1\,800\,000/3000) \times 700 = 420\,000$ miles of roads and $(1\,800\,000/3000) \times 100 = 60\,000$ miles of railways. But the above total area of India (1 800 000 sq. miles) includes mountain ranges like Himalayas or Western Ghats, deserts, backwaters, marshes and such other areas. Obviously we need not cover such areas with elaborate network of roads as per design B. Therefore, according to this design, these estimates represent maximum and our actual requirements will be lower than the above figure.

Minimum requirements:—It will be clear from the previous discussion that the main purpose of the design B is to revive our basic agricultural economy and to bring it to bear certain balanced relation with the new industrial growth. In order to achieve this purpose, we must at least cover our agricultural areas with the regional transport system according to design B. India has about 38% of its total area under actual cultivation and in addition to this there is about 22% of the total area described as "Cultivable waste." It can be tentatively said that out of the total land surface of 1.8 million sq. miles, about $(38\% + 22\%) = 60\%$ is either actually cultivated or is potentially cultivable. This comes to about one million sq. miles which at least may have to be covered with regional transport according to design B. At the rate of 700 miles of roads and 100 miles of railways per 3,000 sq. miles of area as explained above the total requirements for the whole of agricultural regions of India would be $(1\,000\,000/3000) \times 700 =$ approximately 240 000 miles of roads and $(1\,000\,000/3000) \times 100 =$ approximately 30 000 miles of railways. But such agricultural areas can never be continuous being intermixed with considerable non-agricultural and other areas which shall have to be taken into account. Therefore, these estimates represent the minimum and our actual requirements according to the present design will be somewhat higher.

Actual requirements of roads and railways for the whole of India will be somewhere in between these maximum and minimum limits. If we take intermediate values in between these extreme limits, actual requirements of regional transport lines for the whole of India would come to about 330 000 miles of roads and 45 000 miles of railways.

The combined estimates for federal and regional lines of transport have been summarised in the table VII below :—

TABLE VII

Combined linear mileage for the federal and regional systems

	Roads	Railways
Federal system	30 000 miles	30 000 miles
Regional system	330 000 „	45 000 „
Total	360 000 miles	75 000 miles

It has been stated earlier that the design does not take into account the roads and railways which we already have. Even after excluding the old roads from consideration in this manner, the estimated all India requirements of roads under this design are much less than the provisions made by various plans so far proposed. The official plan of the Govt. of India, the "Bombay Plan" and the "Peoples Plan" each provide for the construction of 400,000 miles, 525,000 miles and 670,000 miles of roads respectively. Comparison of all these figures with the above estimate of 360,000 miles of roads according to the present design may indicate how it will be possible to combine economy with efficiency. As pointed out before, one of the objects of this design is to combine economy with efficiency through serving maximum area within minimum linear mileage of roads or railways. This will mean considerable economy and saving not only in the initial capital out-lay but also in the recurring expenditure on their continuous upkeep and maintenance. The money thus saved can be utilised in keeping the standard of our roads and railways much higher than what could have been thought of otherwise.

As regards the financial aspects, since the mileage required under this design would be less than the provisions made by any of our existing plans, it will be within our financial scope to execute the all India plan according to this design.

Financial considerations, though important for the purpose of practical execution of any plan, need not be given undue emphasis. National planning should not be brought down to the level of a commercial enterprise by translating everything in terms of money. In this connection, the achievements of "Youth Railway" movement in Yugoslavia are very much instructive. During 1946-47, Yugoslavia could not finance the construction of a railway which was necessary for the exploitation of her coal resources. The United Youth Organisation of Yugoslavia offered to do the work if the Government supplied the material and technical guidance. The Youth Organisation gave nearly 62 000 volunteers who finished the work within 7 months involving 55 miles of railway with 200 bridges and other constructions. This was followed by another undertaking involving the construction of 150 miles of railway with 37 stations, 5 bridges (one 800 yards long) and 4 tunnels. Nearly 180 000 volunteers of the Youth Organisation participated in this work. If we can get over the colossal inertia of even a small fraction of our 400 millions and channelise their energies along some such constructive lines, we can work wonders.

During the execution of successive 5-year plans in Russia, roads were constructed at the rate of about 30 000 miles per year. If the all India road plan is spread over a period of 15 years, construction of 360 000 miles of roads as estimated above can be undertaken at the rate of less than 25 000 miles per year. Existing situation in India as regards railways is not as bad as that of roads. In view of this fact, construction of railways during the above period of 15 years may be confined to the federal lines alone. It will be seen from table VII that the Federal transport system requires 30 000 miles of railways. This spread over 15 years would involve the construction of 2 000 miles of railways per year. The rest of the railways running parallel to the regional primary lines (45 000 miles, vide table vii) can be gradually constructed afterwards according to the requirements of the individual regional units in proportion to the new industrial and agricultural growth in different areas.

Before we actually launch out on a 15 year programme as above there should be a preparatory period of about 3 years during which following arrangements must first be made:- (1) Training of enough number of technicians so as to be able to construct 25000 miles of roads and 2000 miles of railways together with the

associated telecommunication and electric lines, every year. (2) Production and procurement of enough material and machinery so as to be able to construct 25000 miles of roads and 2000 miles of railways. (3) Fixing of landmarks for the proposed lines of transport through surveys undertaken sufficiently in advance so as to ensure the continuity in the construction of roads and railways at the above rates every year, during the entire period of 15 years.

Since the location of agricultural, industrial and other items of reconstruction will have definite relation with the new transport lines, the work of linear surveys and location of landmarks shall have to be done as rapidly as possible. This will enable us to determine the location of the new reconstruction centres with educational, medical, cultural and various other activities. We can make use of recent methods of rapid aerial surveys by means of high altitude photography and reproduction of three dimensional topographic models. Such surveys are both accurate and time saving. In order to organise such work, we must increase the strength of our Indian Air Force and evolve permanent units for aerial photographic reconnaissance. These activities were started in Canada as early as 1924. During the interwar period great areas have been mapped by the Dominion Air Surveys and all the charts have been recorded at the National Topographical Library of air photographs at Ottawa under the control of the Department of Mines and Resources. The British Ecological Society has also recently suggested that a permanent R. A. F. unit be established, services of which should be available for scientific works and surveys and a central library of air photographs established with due provision for national security.

IX

GENERAL REMARKS AND CONCLUSION

The design for the regional and federal transport proposed in the foregoing pages is to be looked upon as a means to an end and not an end in itself. Means have to be devised in relation to the ends in view. Therefore, in order to understand the utility of the particular design, it is necessary to specify the objects which it is intended to serve. This would explain the need for touching various topics in the previous discussion, which at first sight on a superficial perusal, might appear as irrelevant in a paper concerned with transport and communication. Planning necessarily involves coordinated and synchronised action on various problems which though apparently inconsistent, cannot be treated in complete isolation from each other. Order always implies inter relations.

Many of the suggestions and particularly those relating to straight roads or location of new urban centres, may be judged as purely academic, unpractical, idealistic or utopian. However, it has been explained at relevant places that most of these suggestions are by no means new, being based on some of the recent trends which are already in vogue in some other advanced countries. Unfortunately, before we can believe anything to be practical, we require to be told that it is already done by others. Very often we do not dare to do what is not yet done. Perhaps, due to centuries of miserable existence which we had to endure, we have considerably lost confidence in our own creative abilities. Those that prefer to go round and round in the same accustomed groove and rest content with isolated timeserving patchwork, find the term "Utopia" very convenient and use it freely to describe anything that tends to shake them out of the old rut. Even a commonplace proposition with obvious utility is many times judged as academic or Utopian. But the term "Utopia" implies a relative conception. Thus for instance, if we ask our poor village farmer that he must incorporate in his daily diet sufficient milk, butter, vegetables, fruits etc., he would naturally take it as something Utopian or may consider it as a cruel joke in the face of his starvation when he is not able to get even his simple daily bread. An average American or Australian farmer may on the contrary, accept this as a commonplace suggestion, which in fact it is, and acts upon it promptly. Therefore,

there may be nothing so much wrong with the suggestion as such, as with our own capacity to act upon it. It is true that idealism must adjust its pitch to the prevailing environment and any planning must reconcile itself with certain facts and conditions which exist as present realities. But in this respect we must use some discretion as between short term and long term items of planning. In matters of recurring nature such as food and clothing, we can tune our objective for the time being, to existing realities and try to achieve gradual improvements in definite stages. Thus it will be a distinct achievement for the present, even if we can provide two loaves in place of one to the starved millions or cover the half-naked a little more, before we can aspire to provide them with square meals or keep them well-clad. But in matters of relatively permanent nature such as roads, railways etc. our present condition cannot be made an excuse for scaling down the standards and requirements say, a quarter of a century hence, if we cannot stretch our imagination beyond. In such cases, if once we give wrong direction to the planning it will be difficult to retrace the course. Existing old roads, though insignificant cannot be easily ignored in planning the new transport. If new roads are also allowed to grow in haphazard manner, without foresight, we will make it still more difficult for the future planners to get over the evils associated with the manner of their growth. Roads or railways cannot be so easily built, destroyed and rebuilt in each generation. These must, therefore, be planned in relation to our possible requirements in a reasonable future when ordinary problems such as food, clothing or shelter must fade away into insignificance and we shall be in a position to think in terms of higher values of life.

As regards the suggestions for creating rural-urban coordination and balanced regional development through location of various activities in the manner as indicated in table V, the whole idea may be criticised as very much over-simplified and rather mechanical. However, simplicity is not a disadvantage and a thing, in order to be of any practical utility, need not necessarily be complicated. It is true that the idea is rather mechanical, but if we are to take up the new machine age without letting it recoil upon us like a boomerang we may have to follow some such or any other better procedure. In a way, we are fortunate to be late in taking to the mechanistic industrialisation because we can learn from previous mistakes. Industrial growth in the West is not an unmixed good and we must not repeat the same series of events which have given birth to social disparities, class struggles and various ideologies or -isms. Each of these ideologies has its own value as an analytical approach. By

means of overemphasis, they serve to bring into bold relief certain facts which would not have been seriously taken into cognisance otherwise. Their essential purpose is, therefore, to provide inspiration. They are not meant for apish imitation in toto. For any constructive undertaking, what is required is a process of rational synthesis or integration of the desirable elements among them. This should not be taken as a sort of compromise or an attempt at "Statusquoism". Socialism is certainly a higher stage in the evolution of economic organisation and as such there cannot be any falling back upon earlier primitive forms. But we must not look upon socialism as something static or unchangeable since it should, be quite possible to improve it still further. The Marxian theory of Dialectic Materialism from which it derives its inspiration, is in its very nature a dynamic concept in which the idea of constant plasticity, change or modification in response to the interaction of social events and environment, is inherent. Therefore, we must not accept socialism in its present form nor should we imitate the same methods and means for achieving it which were used elsewhere. Capitalism now is almost a spent up force and at this late hour it would be ridiculous to think of revolution to overthrow it. The time is already ripe when it should be possible to effect such a change by conviction and persuasion through democratic means rather than by force. It is better that we need not dissipate our energies on any elaborate revolution. Energies thus conserved can be channelised in improving upon the socialism itself and carrying its evolution still further on a higher plane. In its present form, socialism is purely an economic determinism that overrides all other values. Therefore, it needs a shift of emphasis. Socialism needs to be humanised in its form as well as contents; in its ends as well as means. This is what Gandhiji sought to do and struggled for, but did not live long enough to see realised. However, it is fortunate that some of those whom we expect to lead the "Socialist" India of tomorrow had the privilege of closer association with Gandhiji. It is possible that the influence of such association may assert itself and our social reorganisation may be so directed that we may be in a position to contribute something rather than imitate others. Let us hope, India would, once again, prove its ancient genius for synthesis. We must receive healthy inspiration from all the existing schools of thought without permitting ourselves to be labelled as '-ists' or enslaved within the pigeonhole of any of the '-isms.' The world would be too monotonous if sociopolitical structures of all the countries are made to conform to the same regimental pattern. So long as certain basic principles of social justice are scrupulously guarded against violation, it should

be permissible to have some measure of variety so as to incorporate and conserve the individual cultural and traditional patterns. Socialism, like Beauty, can be made to express itself in more patterns than one. Whatever good we find in others we must graft on the ancient stocks of our own institutions that are worth preserving, without losing the individuality developed through ages. As emphasised by Gandhiji, "let it not be said of India that it was a mere blotting sheet of other civilisations." He says, "I want the culture of all lands to be blown about my house as freely as possible; but I refuse to be blown off my feet by any."

There cannot be any planning without a guiding objective; and the basic objectives which must determine the character of our planning are, in a way, still somewhat vague and undefined or perhaps controversial. The importance given by Gandhiji to cottage industries through his symbolic emphasis on CHARAKHA has very great significance. Like all symbolisms however, the charakha is very often misunderstood or misinterpreted as an antithesis for modern machine. But if some of the utterances attributed to Gandhiji are correct, what he objects to is not the machine but the Organisation behind it. "What I object to is the craze for machinery and not the machinery as such. The spinning wheel itself is an exquisite piece of machinery." All that he insists on is the inclusion of the human element in the whole picture, which has been grossly neglected by the industrial countries of the west. With each mechanical achievement, their condition was something like that of a fly that went to sip the honey but itself got stuck in it. "They went to catch but they were caught." While aspiring after machine they mechanised the human life itself. Gandhiji would like us to approach the machine as its masters; not as one of its component parts. He advocates decentralisation of industry into small units dispersed in cottages because such an organisation of industry enables us to incorporate the aesthetic and human values in the process of industrial production. For instance, in utter contrast to the usual conditions prevailing in and around a huge monstrous factory, imagine a neat little cottage set in clean environment of profuse greenery. The breeze that blows over the small flower garden in front, fills its airy rooms and makes the whole atmosphere pleasant. You approach nearer and a sweet lullaby of a mother watching over her sleeping child enchants your ear. As she swings the cradle to and fro, she switches on a locally prepared fractional horse power motor that makes a few spindles go round and pour out bundles of yarn. The tune of her lullaby is in harmony with the hum of the small machine and adds to the whole symphony. If, against such

background, we are able to substitute our primitive charakha with something better. In all probability, Gandhiji would not object to it simply because it is a piece of modern machinery. In fact he says "if we could have electricity in every village home, I shall not mind villagers plying their implements and tools with electricity." He would be the last person not to appreciate the creative aspects of modern science. It is true that it has been misused but the machine after all is just what we make of it. If it has been put to wrong use, it can be put to good use also. It is not therefore proper to get horrified with the machine or any other fruit of modern science. The better and nobler course would be to raise the moral standard of the society as a whole so as to make us more worthy of assimilating the fruits of our own pursuit after knowledge. We can surely discard the machine if we want to; but that will be purely a process of negation. We can also take up the machine and make it work for us and also for those, who only know how to invent or discover but do not know how to put it to proper use. If we choose to take the second alternative course, we may make some positive contribution to human progress. By virtue of the particular cultural make-up, perhaps, we as a nation, have some mission to fulfil in this age of atoms and electrons.

Simple things such as roads and railways, if properly designed, can be made to serve as instruments for achieving great ends. The main motive in proposing the present design for regional transport is to give effect to some of the basic objectives of our national planning. There is considerable agreement amongst us that our future industrialisation should be self-reliant and should not bring economic imperialism in its train: it should be well distributed all over the country and should not form conglomerations in isolated clusters; it should be decentralised into small cottages as far as possible and should not give birth to monstrous factories and filthy towns; it should bear certain balanced relation with the basic agrarian economy and the two should not be mutually discordant; it should take into account the aesthetic and human values and should not disregard the basic dignity of Man. The design for regional transport outlined in the foregoing pages is just an attempt to give concrete shape to some of those abstract notions which we have been cherishing so long.

As regards the design for federal transport discussed in the foregoing pages, its significance and important implications can hardly be overemphasised. It will serve to stimulate "the unity in diversity" which is the key-note in the complex symphony of our national culture.

APPENDIX

(A) Questionnaire :—

Do you agree with the following points in the Design proposed here and if not, can you think of better alternatives and suggest improvements over each of the following points :

(1) Designing the Indian transport and communication system according to a unified general plan for the country as a whole *irrespective* of the old roads and railways which have been treated simply as alternative traffic lanes.

(2) Classification of the Indian transport and communication system into Federal and Regional lines and their further sub-division into Primary, Secondary and tertiary lines.

(3) Constitution and functions of the Federal and Regional Boards of transport and communications.

(4) Criteria adopted in the orientation of the Federal lines of transport and communication.

(5) Exclusion of old cities and towns as the direct reference points in the new design and their indirect service and co-ordination through the points where old and new lines of transport intersect.

(6) Orientation of the two Primary lines of Federal transport and communication.

(7) *Okha* → *Calcutta* Primary System : should this line be located so as to run parallel to the Tropic of Cancer (passing through Jubbulpore) with terminal deviations to meet the ports ?

(8) *Cape Comorin* → *Delhi* line : should this line be orientated so as to follow the longitude passing through the Southernmost point of India instead of directing it towards Delhi ? Should this line terminate in the region where Indogangetic plains end and the Himalayan heights begin ? Should we have a well planned Federal Urban Centre at the place where this line would touch the Peshawar → Patna → Sadiya line ?

(9) Should we locate a new well planned capital of India around the place where these two primary lines of Federal transport cross each other somewhere near Itarasi and Harda ? In view of the unsuitable situation of Delhi for defence and other

considerations, its haphazard ugly growth and unhappy historical associations, should we not locate our Federal Capital at the cross point of the two primary lines of Federal Transport as suggested above?

(10) Secondary lines of Federal transport and communication: should we locate these in relation to the old cities and towns or at fixed intervals of degrees of latitudes and longitudes?

(11) Federal tertiary lines: how the coastal lines should be designed and equipped so as to facilitate the national defence along the sea coasts?

(12) Federal tertiary lines along the land frontiers: how these lines should be designed and equipped so as to facilitate the national defence?

(13) Federal tertiary line from Peshawar → Delhi → Patna → Shillong → Sadiya: instead of orientating this line so as to touch these cities, should we locate it just along the transition belt where the southern plains end and the Himalayan heights begin towards the north.

(14) How the entire design proposed here can be modified and equipped so as to facilitate the national defence against any aggression by land, sea or air?

(15) Can you suggest standards and specifications for the roads and railways under different classes of federal and regional lines.

(16) Do you agree with the straight rectangular alignment of transport and communication lines instead of conventional zigzag of serpentine network.

(17) Tele-communications and the location of Radio transmitting stations.

(18) Organisation for the generation, transmission and distribution of the electric power.

(19) System of location of air bases and inland air ways.

(20) System of location of Federal Marine Bases.

(21) Organisation for inland water transport.

(22) Do you agree with the idea of creating the Basic Economic Districts on the lines indicated in the Design B.

(23) Do you think whether creation of such basic economic districts according to Design B would serve the expected socio-

economic results such as balanced urbanization, rural urban coordination and stimulation of both agriculture and industry by facilitating internal marketing.

(24) Do you think such a design would be instrumental in creating a well balanced internal economy and thereby stimulate our share in international trade.

(25) Do you agree with the system of creating new graded urban centres and distribution of their functions as indicated in table V.

(26) Do you agree with the system of location as outlined in table V ? Would it lead to balanced regional development as expected ?

(27) Co-ordination between the political units and the Federal power in respect of planning and execution.

(28) Do you agree with the regional division of India as suggested on pages 40 and 80 ?

(29) Would it not be convenient to treat the areas demarcated by the Federal and Regional transport lines as operational units for the execution of the Federal and Regional items of reconstruction ?

(30) Areas under federal control.

(31) As a preliminary experimental measure, should we develop a few Basic Economic Districts according to design B in low populated areas along the borders of Sind and Rajputana after extending the facilities of canal irrigation to these areas ?

(32) Can we combine the above scheme with rehabilitation of our displaced countrymen from Sind and Punjab on a systematic and permanent basis instead of giving them temporary piecemeal relief ?

(33) Do you think the estimates of linear mileage would approach our actual requirements according to the present design ?

(34) Do you think the present design would be a financially feasible proposition ?

(35) Would it be appropriate to spread its execution over a period of 15 years with a preparatory period of 3 years ? Can you estimate our requirements in men and material for executing the design at the above rate ?

(36) Do you think the present design can be made to serve as one of the instruments for evolving a type of social and economic order which might facilitate rational synthesis of the current conflicting ideologies while retaining our national individuality together with its cultural institutions that are worth preserving ?

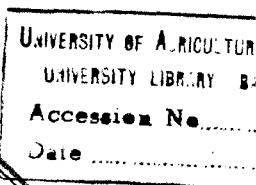
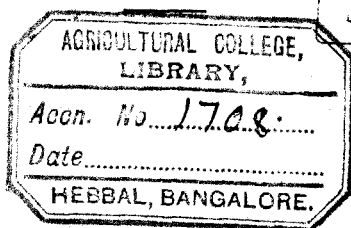
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Schematic Map of India

AND

Diagrams A to D

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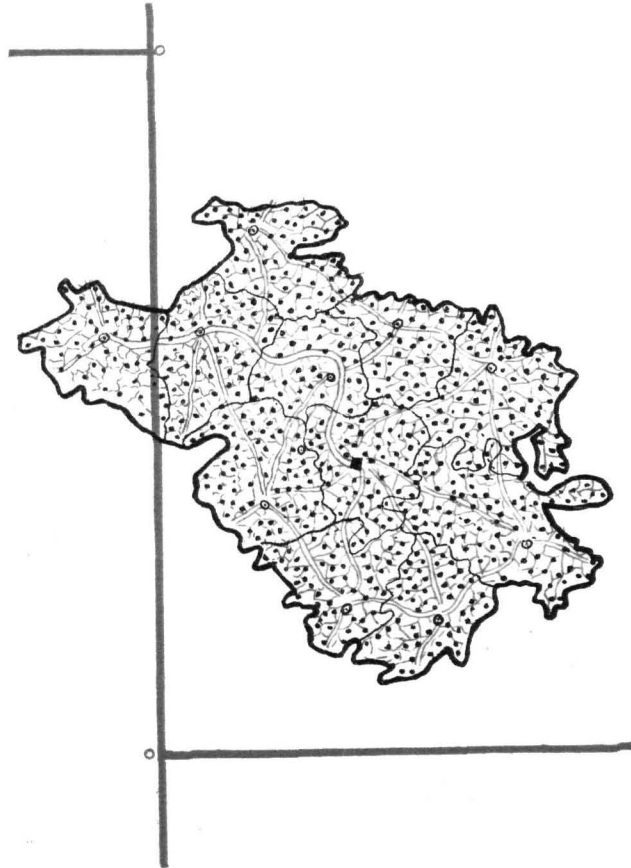


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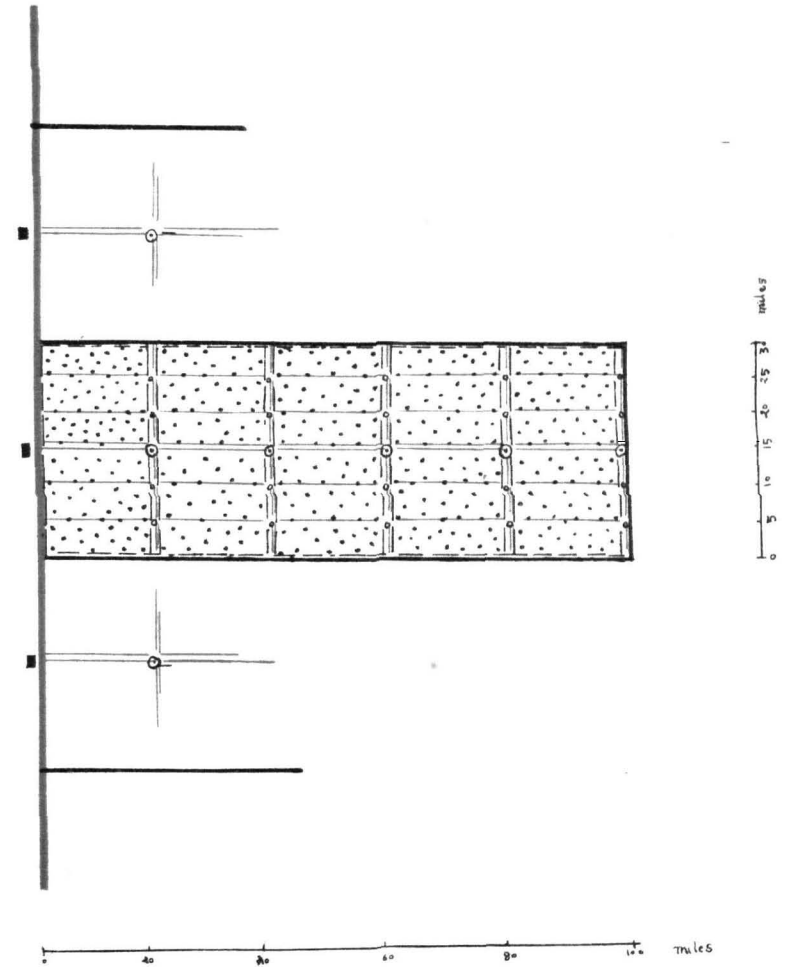
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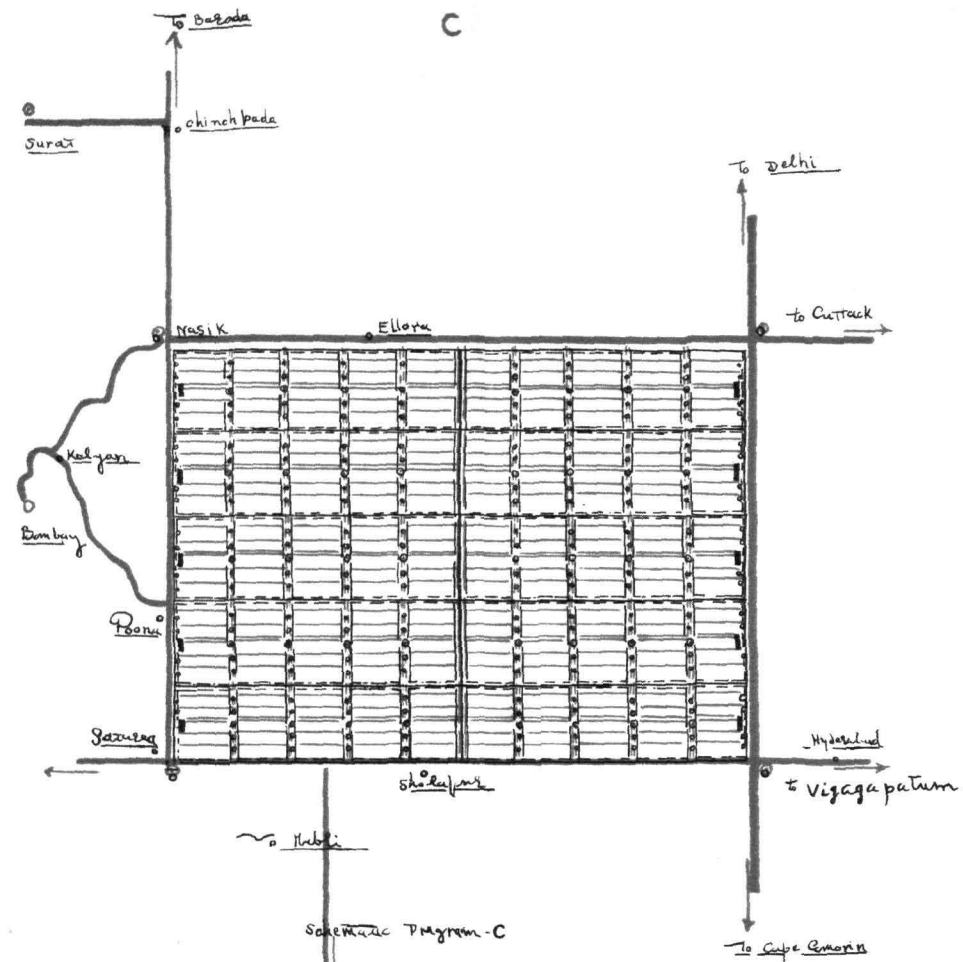
Schematic Diagram A

+

B

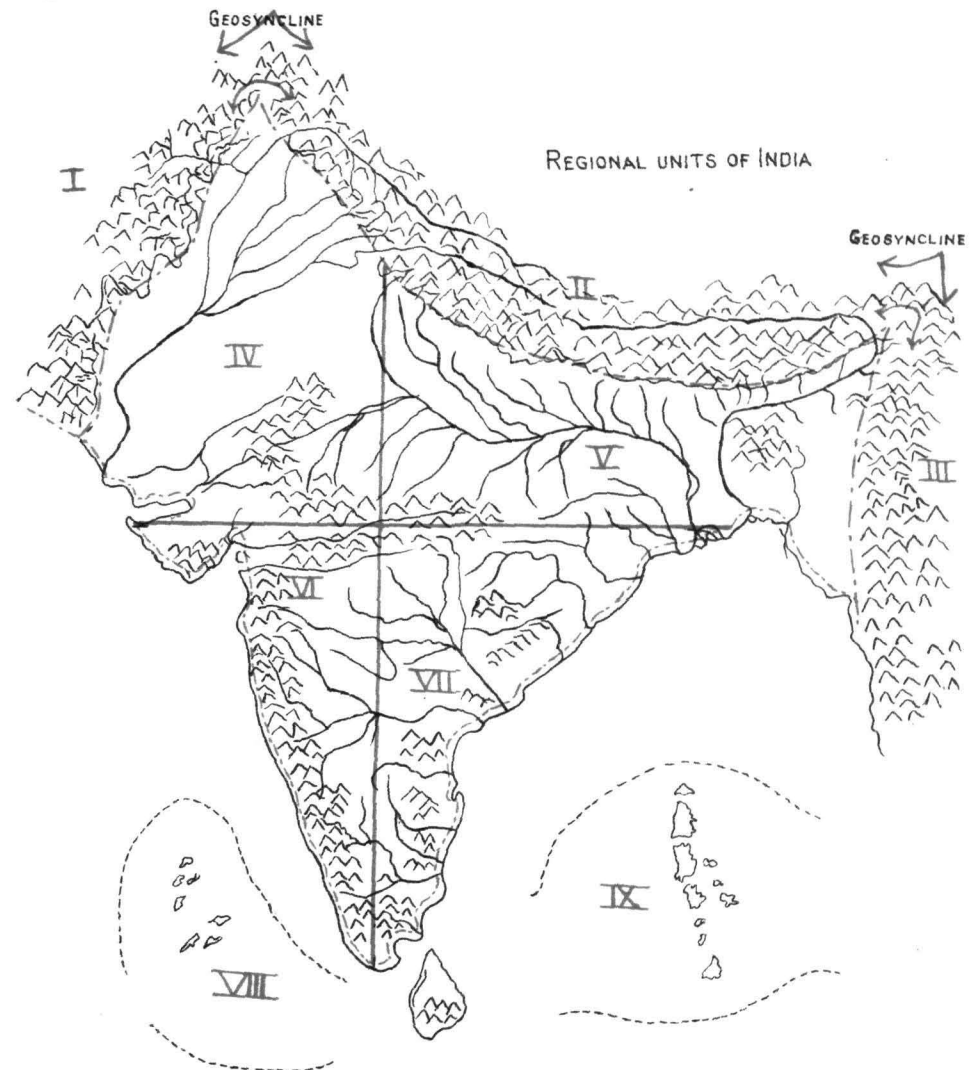


Schematic Diagram B



REFERENCES FOR THE SCHEMATIC DIAGRAMS A. B. & C.

- Boundary line of a reconstruction district. — Boundary line of a reconstruction taluka. — Federal line of transport & communication. — Regional primary line of transport. — Regional secondary line of transport. — Federal tertiary line of transport. Federal reconstruction centre. District reconstruction centre. Taluka reconstruction centre. Sub-taluka reconstruction centre. Village



REFERENCES FOR THE SCHEMATIC DIAGRAM - D.

- High lands. — Rivers. — Federal primary lines of transport. — Federal tertiary lines of transport. — Geosyncline.

INDIAN FEDERAL SYSTEM OF TRANSPORT AND COMMUNICATION

(A SCHEMATIC DIAGRAM)

Scale 1:750,000 N.Miles

REFERENCES

- Primary lines of Federal Transport and Communication.
 - Secondary lines of Federal Transport and Communication.
 - Tertiary lines of Federal Transport and Communication.
 - Foreign roads beyond the Land frontiers.
 - Mountain passes along the Land frontiers.
 - Federal air-bases for land Air Transport; Postal centres for regional assortment of Postal articles and Telecommunication services; Regional short-range Radio and Wireless Transmilling St.
 - Federal Marine and Air bases; Federal Marine Communication centres.
 - Federal Long-range Radio Transmilling Stations.
- Representing Railways, Roads, Telecommunication, Wires and Federal Power-lines (Electrical grid)*

